

153694

2. Available MSDS For Metals/Cyanide



ANTIMONY

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ANTIMONY

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
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PO NBR: RC15-1440-4
ACCT: 553175-01
INDEX: 02-8605-10577
CAT NO: A846500

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 7440-36-0

SUBSTANCE: **ANTIMONY**

TRADE NAMES/SYNONYMS: ANTIMONY BLACK; ANTIMONY REGULUS; A-845; A; 846

CHEMICAL FAMILY:
INORGANIC METAL

MOLECULAR FORMULA: SB MOL WT: 122

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=1 PERSISTENCE=3

COMPONENTS AND CONTAMINANTS

PERCENT: 100 COMPONENT: ANTIMONY

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
0.5 MG/M3 OSHA TWA
0.5 MG/M3 ACGIH TWA
0.5 MG/M3 NIOSH RECOMMENDED TWA

PHYSICAL DATA

DESCRIPTION: SILVERY-WHITE SOLID. BOILING POINT: 2516 F (1635 C)

MELTING POINT: 1202 F (630 C) SPECIFIC GRAVITY: 6.7

VAPOR PRESSURE: 1 MMHG @ 1627 F SOLUBILITY IN WATER: INSOLUBLE

- SOLVENT SOLUBILITY: SOLUBLE IN AMMONIUM SULFIDE

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
MODERATE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FLASH POINT: NONFLAMMABLE

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM
(1984 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.3).

FIREFIGHTING:
USE EXTINGUISHING AGENT SUITABLE FOR TYPE OF SURROUNDING FIRE. MATERIAL ITSELF
DOES NOT BURN READILY. USE FLOODING QUANTITIES OF WATER AS A FOG. USE ALCOHOL
FOAM, CARBON DIOXIDE, OR DRY CHEMICALS.

TOXICITY

100 MG/KG INTRAPERITONEAL-RAT LDLO; CARCINOGEN STATUS: NONE.
ANTIMONY IS AN EYE, SKIN, AND MUCOUS MEMBRANE IRRITANT. IT IS HIGHLY TOXIC
BY INGESTION.

HEALTH EFFECTS AND FIRST AID

INHALATION:
IRRITANT/HIGHLY TOXIC. 80 MG(SB)/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- METALS CONTAINING ANTIMONY MAY RELEASE STIBINE WHEN
UNDERGOING ACID TREATMENT. INHALATION OF STIBINE HAS CAUSED
HEADACHE, DIZZINESS, NAUSEA, VOMITING, WEAKNESS, BITTER
TASTE, HEMOLYTIC ANEMIA, JAUNDICE AND WEAK PULSE. SEVERE
INHALATION OF DUST MAY CAUSE PULMONARY EDEMA.

CHRONIC EXPOSURE- DUST AND FUME MAY CAUSE LARYNGITIS, PHARYNGITIS, BRONCH-
ITIS, TRACHEITIS, PNEUMONITIS, ANEMIA, HEADACHE, WEIGHT
LOSS, BLEEDING GUMS, RHINITIS, & NASAL SEPTUM PERFORATION.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING
HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. KEEP VICTIM WARM AND
AT REST. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
IRRITANT.

ACUTE EXPOSURE- MAY CAUSE REDNESS AND SEVERE IRRITATION WITH SMALL SEPTIC
BLISTERS FORMING AFTER A FEW HOURS. CHEMICAL BURNS MAY
OCCUR.

CHRONIC EXPOSURE- PROLONGED CONTACT MAY CAUSE DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED
AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER
(APPROXIMATELY 15-20 MINUTES) UNTIL NO EVIDENCE OF CHEMICAL RE-
MAINS. IN CASE OF CHEMICAL BURNS, AS DEMONSTRATED BY REDNESS OR

RAW AREAS, COVER AFFECTED AREAS WITH STERILE, DRY DRESSING. BAND-
AGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMED-
IATELY.

EYE CONTACT:
IRRITANT.

ACUTE EXPOSURE- MAY CAUSE SEVERE REDNESS AND PAIN, FOLLOWED BY DARKENING
ING OF THE WHITES OF THE EYES AND DETERIORATION OF VISION.
CHEMICAL BURNS MAY OCCUR.

CHRONIC EXPOSURE- MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY
LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL RE-
MAINS (APPROXIMATELY 15-20 MINUTES). IF CHEMICAL BURNS OCCUR,
APPLY STERILE BANDAGES LOOSELY WITHOUT MEDICATION. GET MEDICAL
ATTENTION IMMEDIATELY.

INGESTION:
HIGHLY TOXIC/IRRITANT.

ACUTE EXPOSURE- THERE MAY BE DIZZINESS, NAUSEA, VOMITING, SEVERE DIARRHEA
WITH MUCOUS AND LATER WITH BLOOD. MAY CAUSE LIVER AND KIDNEY
DAMAGE.

FIRST AID- IF VICTIM IS CONSCIOUS, IMMEDIATELY GIVE 2 TO 4 GLASSES OF
WATER, AND INDUCE VOMITING BY TOUCHING FINGER TO BACK OF THROAT. GET
MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:

NORMALLY STABLE, ANTIMONY DUST MAY IGNITE OR EXPLODE WHEN SUBJECTED TO HIGH
HEAT OR FLAMES. CAN REACT MODERATELY TO VIOLENTLY WITH SOME INCOMPATIBLES.

INCOMPATIBILITIES:

REACTS MODERATELY TO VIOLENTLY WITH ACIDS, HALOGENATED COMPOUNDS, OXIDIZERS,
CHLORINE TRIFLOURIDE AND NITRIC ACID. MAY REACT EXPLOSIVELY WITH ALKALINE
NITRATES, BROMINE AZIDE, DICHLORINE OXIDE, AND MIXTURES WITH PEROXIDES.

DECOMPOSITION:

NOT APPLICABLE: ANTIMONY IS AN ELEMENT.

POLYMERIZATION:

NOT KNOWN TO OCCUR.

CONDITIONS TO AVOID

AVOID CONTACT WITH OR STORAGE WITH INCOMPATIBLE MATERIALS, INCLUDING THOSE
LISTED IN THE REACTIVITY SECTION.

SPILL AND LEAK PROCEDURES

SOIL SPILL:

DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

USE PROTECTIVE COVER SUCH AS A PLASTIC SHEET TO PREVENT MATERIAL FROM DISSOLVING IN FIRE EXTINGUISHING WATER OR RAIN.

NEUTRALIZE SPILL WITH SLAKED LIME, SODIUM BICARBONATE OR CRUSHED LIMESTONE.

AIR SPILL:

KNOCK DOWN VAPORS WITH WATER SPRAY. KEEP UPWIND.

WATER USED TO KNOCK DOWN VAPORS MAY BECOME CORROSIVE OR TOXIC AND SHOULD BE CONTAINED PROPERLY FOR LATER DISPOSAL.

WATER SPILL:

NEUTRALIZE WITH CAUSTIC SODA.

IF MATERIAL IS DISSOLVED, USE SODIUM SULFIDE SOLUTION TO PRECIPITATE HEAVY METALS.

USE DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

ALLOW SPILLED MATERIAL TO AERATE.

OCCUPATIONAL SPILL:

DO NOT TOUCH SPILLED MATERIAL. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA.

PROTECTIVE EQUIPMENT

VENTILATION:

PROVIDE LOCAL EXHAUST VENTILATION SYSTEM TO MEET PERMISSIBLE EXPOSURE LIMITS.

RESPIRATOR:

EXPOSURE LIMIT TO 2.5 MG/M3-

DUST AND MIST RESPIRATOR (SINGLE-USE TYPE PERMITTED).

5 MG/M3- DUST, MIST AND FUME RESPIRATOR EXCEPT SINGLE-USE TYPE AND
QUARTER-MASK TYPE.

FUME OR HIGH-EFFICIENCY PARTICULATE RESPIRATOR.

SUPPLIED-AIR RESPIRATOR.

SELF-CONTAINED BREATHING APPARATUS.

80 MG/M3- TYPE 'C' SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED
IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE OR WITH A
FULL FACEPIECE, HELMET OR HOOD OPERATED IN CONTINUOUS-FLOW
MODE.

ESCAPE- FUME OR HIGH-EFFICIENCY PARTICULATE RESPIRATOR.

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT TO PREVENT

REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

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GLOVES: EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION: WEAR FACESHIELD (8 INCH MINIMUM) AND VENTED SAFETY GOGGLES. DO NOT WEAR CONTACT LENSES WHEN WORKING WITH CHEMICALS.

AUTHORIZED - ALLIED FISHER SCIENTIFIC
CREATION DATE: 01/11/85 REVISION DATE: 10/15/85

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ARSENIC REFERENCE STANDARD SOLUTION
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MATERIAL SAFETY DATA SHEET

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SUBSTANCE IDENTIFICATION

SUBSTANCE: **ARSENIC REFERENCE STANDARD SOLUTION**

TRADE NAMES/SYNONYMS:
SA-449; ACC02025

CHEMICAL FAMILY:
Inorganic acid

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: NITRIC ACID PERCENT: 11
CAS# 7697-37-2

COMPONENT: ARSENIC TRIOXIDE PERCENT: 1
CAS# 1327-53-3

COMPONENT: WATER PERCENT: 88

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:

NITRIC ACID:
2 ppm (5 mg/m3) OSHA TWA; 4 ppm (10 mg/m3) OSHA STEL
2 ppm (5 mg/m3) ACGIH TWA; 4 ppm (10 mg/m3) ACGIH STEL
2 ppm (5 mg/m3) NIOSH recommended TWA;
4 ppm (10 mg/m3) NIOSH recommended STEL
10 ppm (25 mg/m3) DFG MAK TWA;
20 ppm (50 mg/m3) DFG MAK 5 minute peak, momentary value, 8 times/shift

Measurement method: Silica gel tube; sodium bicarbonate/sodium carbonate;
ion chromatography; (NIOSH Vol. III # 7903, Inorganic Acids).

1000 pounds SARA Section 302 Threshold Planning Quantity
1000 pounds SARA Section 304 Reportable Quantity
1000 pounds CERCLA Section 103 Reportable Quantity
500 pounds OSHA Process Safety Management Threshold Quantity
(94.5% by weight or greater)
Subject to SARA Section 313 Annual Toxic Chemical Release Reporting

ARSENIC, INORGANIC AND SOLUBLE COMPOUNDS:

10 ug(As)/m3 OSHA TWA
0.01 mg(As)/m3 ACGIH TWA
ACGIH A1-Confirmed Human Carcinogen.
2 ug(As)/m3 NIOSH recommended 15 minute ceiling

Measurement method: Particulate filter; acid; atomic absorption
spectrometry; (NIOSH Vol. III # 7900).

Subject to SARA Section 313 Annual Toxic Chemical Release Reporting
Subject to California Proposition 65 cancer and/or reproductive toxicity
warning and release requirements- (February 27, 1987)

**OSHA revoked the final rule limits of January 19, 1989 in response to the
11th Circuit Court of Appeals decision (AFL-CIO v. OSHA) effective
June 30, 1993. See 29 CFR 1910.1000 (58 FR 35338)**

PHYSICAL DATA

DESCRIPTION: Colorless liquid. BOILING POINT: 212 F (100 C)
MELTING POINT: 32 F (0 C) SPECIFIC GRAVITY: 1.1
VAPOR PRESSURE: 14 mmHg @ 20 C EVAPORATION RATE: (ether=1) 1 PH: acidic

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SOLUBILITY IN WATER: soluble VAPOR DENSITY: 0.7

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:

Negligible fire hazard when exposed to heat or flame.

FLASH POINT: non-flammable FLAMMABILITY CLASS(OSHA): IIIB

FIREFIGHTING MEDIA:

Dry chemical, carbon dioxide, water spray or regular foam
(1990 Emergency Response Guidebook, DOT P 5800.5).

For larger fires, use water spray, fog or regular foam
(1990 Emergency Response Guidebook, DOT P 5800.5).

FIREFIGHTING:

Move container from fire area if you can do it without risk. Apply cooling
water to sides of containers that are exposed to flames until well after fire
is out. Stay away from ends of tanks (1990 Emergency Response Guidebook,
DOT P 5800.5, Guide Page 59).

Extinguish using agents indicated; do not use water directly on material.
If large amounts of combustible materials are involved, use flooding amounts
of water as spray and fog. Use water spray to absorb corrosive, poisonous
vapors. Cool containers with flooding amounts of water from as far a distance
as possible. Avoid breathing corrosive, poisonous vapors; keep upwind.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49-CFR 172.101:
Poison B

Department of Transportation labeling requirements 49-CFR 172.101 and
SUBPART E:
Poison

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49-CFR 173.346
EXCEPTIONS: 49-CFR 173.345

Final rule on hazardous materials regulations (HMR, 49 CFR parts 171-180),
docket numbers HM-181, HM-181a, HM-181b, HM-181c, HM-181d and HM-204.
Effective date October 1, 1991. However, compliance with the regulations is
authorized on and after January 1, 1991. (55 FR 52402, 12/21/90)

Except for explosives, inhalation hazards, and infectious substances, the
effective date for hazard communication requirements is extended to
October 1, 1993. (56 FR 47158, 09/18/91)

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
Arsenic trioxide-UN 1561

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
6.1 - Poisonous materials

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG II

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101
AND SUBPART E:
Poison

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS
EXCEPTIONS: None
NON-BULK PACKAGING: 49 CFR 173.212
BULK PACKAGING: 49 CFR 173.242

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: 25 kg
CARGO AIRCRAFT ONLY: 100 kg

TOXICITY

NITRIC ACID:

TOXICITY DATA

ANHYDROUS: 49 ppm/4 hours inhalation-rat LC50 (Van Water & Rogers, Inc
MSDS); 2500 ppm/1 hour inhalation-rat LC50 (Dupont MSDS); 430 mg/kg
oral-human LDLO, 50-500 mg/kg oral-unspecified species LD50 (Dupont MSDS).
110 mg/kg unreported-man LDLO, reproductive effects data (RTECS).
MONOHYDRATE: No data available
TRIHYDRATE: No data available
CARCINOGEN STATUS: None
LOCAL EFFECTS: Corrosive: inhalation, skin, eyes, ingestion
ACUTE TOXICITY LEVEL: Highly toxic by inhalation; toxic by ingestion.
TARGET EFFECTS: No data available
AT INCREASED RISK FROM EXPOSURE: Persons with impaired pulmonary function.

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pre-existing eye and skin disorders.

ARSENIC TRIOXIDE, SOLID:
TOXICITY DATA: 29 mg/kg oral-man LDLo; 1429 ug/kg oral-human LDLo; 286 mg/kg oral-man LDLo; 2857 mg/kg oral-man LDLo; 14,600 ug/kg oral-rat LD50; 31,500 ug/kg oral-mouse LD50; 20,190 ug/kg oral-rabbit LD50; 10 mg/kg oral-dog LDLo; 30 mg/kg oral-cattle LDLo; 8 mg/kg subcutaneous-rat LDLo; 9800 ug/kg subcutaneous-mouse LD50; 10,700 ug/kg intravenous-mouse LD50; 10,560 ug/kg intravenous-rabbit LDLo; 871 mg/kg intraperitoneal-rat LD50; 2 mg/kg intradermal-dog LDLo; 2941 ug/kg unreported-man LDLo; 8 mg/kg unreported-rat LDLo; mutagenic data (RTECS); reproductive effects data (RTECS); tumorigenic data (RTECS).
CARCINOGEN STATUS: OSHA Carcinogen; Known Human Carcinogen (NTP); Human Sufficient Evidence, Animal Limited Evidence (IARC Group-1). An increased incidence of skin and lung cancer has been associated with inorganic arsenic compounds through medical treatment, contaminated drinking water or occupational exposure. Cancers at other site have also been reported, but a clear association has not been confirmed.
LOCAL EFFECTS: Irritant- inhalation, skin and eye.
ACUTE TOXICITY LEVEL: Highly toxic by ingestion.
TARGET EFFECTS: Neurotoxin; sensitizer- dermal. Poisoning may also affect the skin, gastrointestinal tract, liver, kidneys, hematopoietic and cardiovascular systems.
AT INCREASED RISK FROM EXPOSURE: Persons with pre-existing diabetes, cardiovascular diseases, allergic or other skin diseases, neurologic, hepatic or renal lesions.

HEALTH EFFECTS AND FIRST AID

INHALATION:

NITRIC ACID:

CORROSIVE/HIGHLY TOXIC. 100 ppm Immediately Dangerous to Life or Health.

ACUTE EXPOSURE- Inhalation of acidic substances may cause severe respiratory irritation with coughing, choking, and possibly yellowish burns of the mucous membranes. Other initial symptoms may include dizziness, headache, nausea, and weakness. Pulmonary edema may be immediate in the most severe exposures, but more likely will occur after a latent period of 5-72 hours. The symptoms may include tightness in the chest, dyspnea, dizziness, frothy sputum, and cyanosis. Physical findings may include hypotension, weak, rapid pulse, moist rales, and hemoconcentration. In non-fatal cases, complete recovery may occur within a few days or weeks or, convalescence may be prolonged with frequent relapses and continued dyspnea and other signs and symptoms of pulmonary insufficiency. In severe exposures, death due to anoxia may occur within a few hours after onset of the symptoms of pulmonary edema or following a relapse.
CHRONIC EXPOSURE- Depending on the concentration and duration of exposure, repeated or prolonged exposure to an acidic substance may cause erosion of the teeth, inflammatory and ulcerative changes in the mouth, and possibly jaw necrosis. Bronchial irritation with cough and frequent attacks of bronchial pneumonia may occur. Gastrointestinal disturbances are also possible.

ARSENIC TRIOXIDE, SOLID:

IRRITANT/NEUROTOXIN/CARCINOGEN.

ACUTE EXPOSURE- Inorganic arsenic compounds may cause irritation of the respiratory tract with cough, foamy sputum, pain in the chest, dyspnea, and possibly pulmonary edema. There may be cyanosis of the face, giddiness, restlessness, lassitude, headache, extreme general weakness, an initial rise, then fall in temperature, hypotension, pain in the limbs, and leukocytosis. Delayed gastrointestinal symptoms may include nausea, vomiting, colic and diarrhea. Acute, severe systemic intoxication by inhalation is unlikely, but if sufficient amounts are absorbed, other effects as described in acute ingestion are possible. One case of a single prolonged exposure to an arsenical weed spray resulted in megaloblastic anemia.

CHRONIC EXPOSURE- Repeated exposure to inorganic arsenic compounds may cause weakness, persistent headache, anorexia, weight loss, fatigue, pallor, malaise, low grade fever, salivation, and gastrointestinal disturbances with nausea, occasional vomiting, a sense of heaviness in the stomach, colic and diarrhea alternating with constipation. Effects on mucous membranes may result in conjunctivitis with a sensation of irritation and lacrimation, a catarrhal state of the nose, larynx, and respiratory passages, coryza, hoarseness, mild tracheobronchitis, and stomatitis. Perforation of the nasal septum may occur. Many forms of skin lesions are possible including pigmentation (melanosis), erythema, eczema, keratosis of palms and soles, localized subcutaneous edema, especially of the eyelids, scaling and desquamation, brittle nails, and white bands on the nails (Mees lines), alopecia and vitiligo. Peripheral neuritis may develop, initially of the hands and feet, which is usually sensory with paresthesia, hypesthesia, pain, burning, and tenderness. In very severe cases, motor paralysis and muscle atrophy may occur with foot and wrist drop. Effects on the liver, kidney, myocardium, and bone marrow may occur but are more common with chronic ingestion. Inorganic arsenic compounds have been shown to be lung and skin carcinogens in humans. The latency time between onset of exposure and the appearance of cancer is usually between 15 and 30 years.

FIRST AID- Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Maintain airway and blood

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pressure and administer oxygen if available. Keep affected person warm and at rest. Treat symptomatically and supportively. Administration of oxygen should be performed by qualified personnel. Get medical attention immediately.

SKIN CONTACT:

NITRIC ACID:

CORROSIVE

ACUTE EXPOSURE- Direct contact with liquid or vapor may cause severe pain, burns and possibly yellowish stains. Burns may be deep with sharp edges and heal slowly with scar tissue formation. Dilute solutions of nitric acid may produce mild irritation and harden the epidermis without destroying it. Concentrated acid solutions applied to over 25% of the skin area in rats produced elevated methemoglobin and blood nitrate levels.
CHRONIC EXPOSURE- Effects depend on the concentration and duration of exposure. Repeated or prolonged contact with acidic substances may result in dermatitis or effects similar to acute exposure.

ARSENIC TRIOXIDE, SOLID:

IRRITANT/SENSITIZER.

ACUTE EXPOSURE- Arsenic and inorganic arsenic compounds irritate the skin with erythema, itching and burning. Sensitization dermatitis may occur in previously exposed persons. Inorganic arsenic compounds are slightly absorbed through the skin when administered in a lipid vehicle. Poisoning has caused alopecia, bronzing of the skin, and brittle nails. If sufficient absorption occurs severe gastritis or gastroenteritis may occur.
CHRONIC EXPOSURE- Occupational exposure to airborne arsenic may cause burning and itching with two types of dermatitis due to local irritation or sensitization. An eczematous type with erythema, swelling and papules or vesicles and a follicular type with erythema and follicular swelling or pustules. The dermatitis is usually localized on the most heavily exposed areas such as the face, back of the neck, forearms, wrists and hands. Chronic dermal lesions may follow this type of initial reaction, but usually only after many years of exposure. Hyperkeratosis, warts and melanosis of the skin are conspicuous signs. These chronic skin lesions, particularly the hyperkeratosis, may develop into precancerous and cancerous lesions.

FIRST AID- Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

EYE CONTACT:

NITRIC ACID:

CORROSIVE

ACUTE EXPOSURE- Direct contact with acidic substances may cause pain and lacrimation, photophobia, and burns, possibly severe. The degree of injury depends on the concentration and duration of contact. In mild burns, the epithelium regenerates rapidly and the eye recovers completely. In severe cases, the extent of injury may not be fully apparent for several weeks. Ultimately, the whole cornea may become deeply vascularized and opaque resulting in blindness. In the worst cases, the eye may be totally destroyed. Concentrated nitric acid may impart a yellow color to the eye upon contact.
CHRONIC EXPOSURE- Effects depend on the concentration and duration of exposure. Repeated or prolonged exposure to acidic substances may cause conjunctivitis or effects as in acute exposure.

ARSENIC TRIOXIDE, SOLID:

IRRITANT.

ACUTE EXPOSURE- Arsenical dust may cause irritation characterized by itching, burning, watering of the eyes, photophobia and sometimes hyperemia and chemosis.

CHRONIC EXPOSURE- Repeated or prolonged contact may cause discomfort, edema of the lids, and corneal injury and opacity.

FIRST AID- Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

INGESTION:

NITRIC ACID:

CORROSIVE/TOXIC

ACUTE EXPOSURE- Acidic substances may cause circumoral burns with yellow discoloration and corrosion of the mucous membranes of the mouth, throat and esophagus. There may be immediate pain and difficulty or inability to swallow or speak. Epiglottal edema may result in respiratory distress and possibly asphyxia. Marked thirst, epigastric pain, nausea, vomiting and diarrhea may occur. Depending on the degree of esophageal and gastric corrosion, the vomitus may contain fresh or dark precipitated blood and large shreds of mucosa. Shock with marked hypotension, weak, rapid pulse, shallow respiration, and clammy skin may occur. Circulatory collapse may ensue and if uncorrected, lead to renal failure. In severe cases, gastric, and to a lesser degree, esophageal perforation and subsequent peritonitis may occur and be accompanied by fever and abdominal rigidity. Esophageal, gastric and pyloric stricture may occur within a few weeks, but may be delayed for months or even years. Death may result within a short time.

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from asphyxia, circulatory collapse or aspiration of even minute amounts. Later death may be due to peritonitis, severe nephritis or pneumonia. Coma and convulsions sometimes occur terminally.

CHRONIC EXPOSURE: Depending on the concentration, repeated ingestion of acidic substances may result in inflammatory and ulcerative changes in the mucous membranes of the mouth and other effects as in acute ingestion. Reproductive effects have been reported in animals.

**ARSENIC TRIOXIDE, SOLID:
NEUROTOXIN/CARCINOGEN/HIGHLY TOXIC.**

ACUTE EXPOSURE: The approximate lethal dose is 120 mg. A case of ingestion during the 30th week of pregnancy resulted in maternal toxicity; premature delivery and neonatal death followed. Large doses of inorganic arsenic compounds may cause systemic poisoning with symptoms usually appearing one-half to four hours after ingestion. Symptoms may include burning and pain in the chest, esophagus, stomach and bowel, constriction in the throat, dysphagia, weakness, a sweetish metallic taste, violent gastroenteritis with vomiting, copious watery or bloody diarrhea containing shreds of mucous, and dehydration with intense thirst and muscular cramps. There may be a garlic odor to the breath, vomit, and feces. Vertigo, frontal headache, fever, sweating, restlessness, confusion, delirium and even mania may occur. With less than lethal doses, some symptoms may develop without prominent gastrointestinal signs. Later symptoms may include cold, clammy skin, cyanosis, rapid, feeble pulse, hypotension, shock, cardiac disturbances, including ventricular fibrillation, and general paralysis. Death within 1-48 hours is usually due to circulatory failure; coma and convulsions may occur terminally. Death delayed 3-14 days is usually due to dehydration, electrolyte imbalance and gradual hypotension. Liver and kidney degenerative changes may be present. If the acute phase is survived, delayed sequelae may include: A variety of skin lesions, alopecia, Mees lines, edema of the face and eyelids, and conjunctivitis; neuropathy with sensory and motor involvement; encephalopathy; liver damage with multiple profile abnormalities, jaundice, and hepatomegaly; renal failure with hematuria, albuminuria, glucosuria, and oliguria or anuria; and anemia and leukopenia, especially neutropenia. Weakness and diarrhea may persist for weeks.

CHRONIC EXPOSURE: Reproductive effects have been reported in animals. Repeated ingestion of small amounts of inorganic arsenic compounds may cause effects as described in chronic inhalation. Other reported symptoms may include metallic taste, thirst, garlic odor to the breath and sweat, anxiety, hot flushes, ataxia, mental confusion, edema of the ankles and lower eyelids, nose bleeds and bleeding gums. Liver effects may include jaundice, hepatomegaly, cirrhosis, ascites, non-cirrhotic portal hypertension, and fatty infiltration and central necrosis. The kidneys may be severely damaged and there may be oliguria, proteinuria, hematuria, and casts. Hematologic effects may include anemia, leukopenia, especially neutropenia, thrombocytopenia without severe bleeding, disturbed erythropoiesis, and disturbed or depressed myelopoiesis. Aplastic anemia with subsequent fatal myelogenous leukemia has been reported. Reported cardiovascular effects include severe cardiac peripheral edema and left-sided heart failure and gangrene of the extremities due to peripheral vascular changes. An increased incidence of chromosomal aberrations has been observed in persons treated with arsenical compounds. Cancer in humans is associated with chronic ingestion of arsenic.

FIRST AID: Remove by gastric lavage or emesis. Follow with a saline cathartic. Maintain blood pressure, airway, and give oxygen if respiration is depressed. Do not perform gastric lavage or emesis if victim is unconscious. Get medical attention immediately. (Dreisbach, Handbook of Poisoning, 12th Ed.) Administration of gastric lavage or oxygen should be performed by qualified medical personnel.

REACTIVITY

REACTIVITY:
Stable under normal temperatures and pressures.

INCOMPATIBILITIES:

NITRIC ACID:

ACETIC ACID: May react explosively.
ACETIC ANHYDRIDE: Explosive reaction by friction or impact.
ACETONE: May react explosively.
ACETONITRILE: Explosive mixture.
4-ACETOXY-3-METHOXYBENZALDEHYDE: Exothermic reaction.
ACROLEIN: Temperature and pressure increase in closed container.
ACRYLONITRILE: Explosive reaction at 90 C.
ACRYLONITRILE-METHACRYLATE COPOLYMER: Incompatible.
ALCOHOLS: Possible violent reaction or explosion; formation of explosive compound in the presence of heavy metals.
ALKANETHIOLES: Exothermic reaction with possible ignition.
2-ALKOXY-1,3-DITHIA-2-THIOPHOSPHOLANE: Ignition reaction.
ALLYL ALCOHOL: Temperature and pressure increase in closed container.
ALLYL CHLORIDE: Temperature and pressure increase in closed container.
AMINES (ALIPHATIC OR AROMATIC): Possible ignition reaction.
2-AMINOETHANOL: Temperature and pressure increase in closed container.
2-AMINOTHIAZOLE: Explosive reaction.
AMMONIA (GAS): Burns in an atmosphere of nitric acid vapor.
AMMONIUM HYDROXIDE: Temperature and pressure increase in closed container.

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AMMONIUM NITRATE: Forms explosive mixture.
ANILINE: Ignites on contact.
ANILINIUM NITRATE: Forms explosive solution.
ANION EXCHANGE RESINS: Possible violent exothermic reaction.
ANTIMONY: Violent reaction.
ARSINE: Explosive reaction.
ARSINE-BORON TRIBROMIDE: Violent oxidation.
BASES: Reacts.
BENZENE: Explosive reaction.
BENZIDINE: Spontaneous ignition.
BENZONITRILE: Possible explosion.
BENZOTHIOPHENE DERIVATIVES: Formation of possibly explosive compounds.
N-BENZYL-N-ETHYLANILINE: Vigorous decomposition.
1,4-BIS(METHOXYMETHYL)2,3,5,6-TETRAMETHYLBENZENE: Gas evolution.
BISMUTH: Intense exothermic reaction or explosion.
1,3-BIS(TRIFLUOROMETHYL)BENZENE: Possible explosion.
BORON: Violent reaction with incandescence.
BORON DECAHYDRIDE: Explosive reaction.
BORON PHOSPHIDE: Ignition reaction.
BROMINE PENTAFLUORIDE: Ignition reaction.
N-BUTYL MERCAPTAN: Ignition reaction.
N-BUTYRALDEHYDE: Temperature and pressure increase in closed container.
CADMIUM PHOSPHIDE: Explosive reaction.
CALCIUM HYPOPHOSPHITE: Ignition reaction.
CARBON (PULVERIZED): Violent reaction.
CELLULOSE: Forms easily combustible ester.
CHLORATES: Reacts.
CHLORINE: Incompatible.
CHLORINE TRIFLUORIDE: Violent reaction.
CHLORO BENZENE: Possible explosion.
4-CHLORO-2-NITROANILINE: Forms explosive compound.
CHLOROSULFONIC ACID: Temperature and pressure increase in closed container.
COAL: Explosive mixture.
COATINGS: May be attacked.
CRESOL: Temperature and pressure increase in closed container.
CROTONALDEHYDE: Violent decomposition with ignition.
CUMENE: Temperature and pressure increase in closed container.
CUPRIC NITRIDE: Explosive reaction.
CUPROUS NITRIDE: Violent reaction.
CYANATES: Possible explosive reaction.
CYCLOHEXANONE: Violent reaction.
CYCLOHEXYLAMINE: Forms explosive compound.
CYCLOPENTADIENE: Explosive reaction.
1,2-DIAMINOETHANEBIS(TRIMETHYLGOLD): Explosive reaction.
DIBORANE: Spontaneous ignition.
DI-2-BUTOXYETHYL ETHER: Violent decomposition reaction.
2,6-DI-T-BUTYL PHENOL: Formation of explosive compound.
DICHLOROETHANE: Forms shock and heat sensitive mixture.
DICHLOROETHYLENE: Forms explosive compound.
DICHLOROMETHANE: Forms explosive solution.
DICYCLOPENTADIENE: Spontaneous ignition.
DIENES: Ignition reaction.
DIETHYLAMINO ETHANOL: Possible explosion.
DIETHYL ETHER: Possible explosion.
3,6-DIHYDRO-1,2,2H-OXAZINE: Explosive interaction.
DIISOPROPYL ETHER: Temperature and pressure increase in closed container.
DIMETHYLAMINOMETHYLFERROCENE: Violent decomposition if heated.
DIMETHYL ETHER: Forms explosive compound.
DIMETHYL HYDRAZINE: Ignites on contact.
DIMETHYL SULFOXIDE + 1,4-DIOXANE: Explosion.
DIMETHYL SULFOXIDE + 14% WATER: Explosive reaction.
DINITROBENZENE: Explosion hazard.
DINITROTOLUENE: Explosive reaction.
DIOXANE + PERCHLORIC ACID: Possible explosion.
DIPHENYL DISTIBENE: Explosive oxidation.
DIPHENYL MERCURY + CARBON DISULFIDE: Violent reaction.
DIPHENYL TIN: Ignition reaction.
DISODIUM PHENYL ORTHOPHOSPHATE: Violent explosion.
DIVINYL ETHER: Possible ignition reaction.
EPICHLOROHYDRIN: Temperature and pressure increase in closed container.
ETHANESULFONAMIDE: Explosive reaction.
ETHOXY-ETHYLENE DITHIOPHOSPHATE: Ignition on contact.
M-ETHYL ANILINE: Ignition reaction.
ETHYLENE DIAMINE: Temperature and pressure increase in closed container.
ETHYLENE GLYCOL: Forms shock and heat sensitive mixture.
ETHYLENIMINE: Temperature and pressure increase in closed container.
5-ETHYL-2-METHYL PYRIDINE: Explosive reaction.
ETHYL PHOSPHINE: Ignition reaction.
5-ETHYL-2-PICOLINE: Forms explosive compounds.
FERROUS OXIDE (POWDERED): Intense exothermic reaction.
FLUORINE: Possible explosive reaction.
FORMIC ACID: Exothermic reaction with release of toxic gases.
2-FORMYLAMINO-1-PHENYL-1,3-PROPANEDIOL: Possible explosion.
FUEL OIL (BURNING): Explosion.
FULMINATES: Reacts.
FURFURYLDENE KETONES: Ignites on contact.
GERMANIUM: Violent reaction.
GLYCEROL: Possible explosion.
GLYOXAL: Temperature and pressure increase in closed container.
HEXALITHIUM DISILICIDE: Explosive reaction.

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HEXAMETHYLBENZENE: Possible explosion.
2,2,4,4,6,6-HEXAMETHYLTRITHIANE: Explosive oxidation.
HEXENAL: Explodes on heating.
HYDRAZINE: Violent reaction.
HYDRAZOIC ACID: Energetic reaction.
HYDROGEN IODIDE: Ignition reaction.
HYDROGEN PEROXIDE: Forms unstable mixture.
HYDROGEN PEROXIDE AND KETONES: Forms explosive products.
HYDROGEN PEROXIDE AND MERCURIC OXIDE: Forms explosive compounds.
HYDROGEN PEROXIDE AND THIOUREA: Forms explosive compounds.
HYDROGEN SELENIDE: Ignition reaction.
HYDROGEN SULFIDE: Incandescent reaction.
HYDROGEN TELLURIDE: Ignition and possible explosive reaction.
INDANE AND SULFURIC ACID: Explosive reaction.
ISOPRENE: Temperature and pressure increase in closed container.
KETONES (CYCLIC): Violent reaction.
LACTIC ACID + HYDROFLUORIC ACID: Explosive reaction.
LITHIUM: Ignition reaction.
LITHIUM SILICIDE: Incandescent reaction.
MAGNESIUM: Explosive reaction.
MAGNESIUM + 2-NITROANILINE: May ignite on contact.
MAGNESIUM PHOSPHIDE: Incandescent reaction.
MAGNESIUM SILICIDE: Violent reaction.
MAGNESIUM-TITANIUM ALLOY: Forms shock and heat sensitive mixture.
MANGANESE (POWDERED): Incandescence and possible explosion.
MESITYL OXIDE: Temperature and pressure increase in closed container.
MESITYLENE: Possible explosive reaction.
METALS: Violent reaction with explosion or ignition.
METAL ACETYLIDES: Violent or explosive reaction.
METAL CARBIDES: Violent or explosive reaction.
METAL CYANIDES: Explosive reactions.
METAL FERRICYANIDE OR FERROCYNIDE: Violent reaction.
METAL SALICYLATES: Forms explosive compounds.
METAL THIOCYANATES: Possible explosion.
2-METHYLBENZIMIDAZOLE + SULFURIC ACID: Possible explosive reaction.
4-METHYLCYCLOHEXANONE: Explosive reaction.
2-METHYL-5-ETHYLPYRIDINE: Temperature and pressure increase in closed container.
METHYL THIOPHENE: Ignition reaction.
NEODYMIUM PHOSPHIDE: Violent reaction.
NICKEL TETRAPHOSPHIDE: Ignition reaction.
NITRO AROMATIC HYDROCARBONS: Forms highly explosive products.
NITROBENZENE: Explosive reaction, especially in the presence of water.
NITROMETHANE: Explosive reaction.
NITRONAPHTHALENE: Explosion hazard.
NON-METAL OXIDES: Explosive reaction.
OILUM: Temperature and pressure increase in closed container.
ORGANIC MATERIALS: Fire and explosion hazard.
ORGANIC SUBSTANCES AND PERCHLORATES: Possible explosion.
ORGANIC SUBSTANCES AND SULFURIC ACID: Possible explosion.
PHENYL ACETYLENE + 1,1-DIMETHYLHYDRAZINE: Violent reaction.
PHENYL ORTHOPHOSPHORIC ACID DISODIUM SALT: Forms explosive products.
PHOSPHINE + OXYGEN: Spontaneous ignition.
PHOSPHONIUM IODIDE: Ignition reaction.
PHOSPHORUS (VAPOR): Ignites when heated.
PHOSPHOROUS HALIDES: Ignition reaction.
PHOSPHORUS TETRAIODIDE: Vigorous reaction.
PHOSPHORUS TRICHLORIDE: Explosive reaction.
PHTHALIC ACID AND SULFURIC ACID: Possible explosive reaction.
PHTHALIC ANHYDRIDE: Exothermic reaction and forms explosive products.
PICRATES: Reacts.
PLASTICS: May be attacked.
POLYALKENES: Intense reaction.
POLYDIBROMOSILANES: Explosive reaction.
POLY(ETHYLENE OXIDE) DERIVATIVES: Possible explosion.
POLYPROPYLENE: Temperature and pressure increase in a closed container.
POLY(SILYLENE): Ignition.
POLYURETHANE (FOAM): Vigorous reaction.
POTASSIUM HYPOPHOSPHITE: Explosive reaction.
POTASSIUM PHOSPHINATE: Explodes on evaporation.
8-PROPIOLACTONE: Temperature and pressure increase in closed container.
PROPIOPHENONE + SULFURIC ACID: Exothermic reaction above -5 C.
PROPYLENE GLYCOL + HYDROFLUORIC ACID + SILVER NITRATE: Explosive mixture.
PROPYLENE OXIDE: Temperature and pressure increase in closed container.
PYRIDINE: Temperature and pressure increase in closed container.
PYROCATECHOL: Ignites on contact.
REDUCING AGENTS: Possible explosive or ignition reaction.
RESORCINOL: Possible explosion.
RUBBER: Vigorous reaction, possible explosion.
SELENIUM: Vigorous reaction.
SELENIUM HYDRIDE: Ignition or incandescent reaction.
SELENIUM IODOPHOSPHIDE: Explosive reaction.
SILICON: Violent reaction.
SILICONE OIL: Possible explosion.
SILVER BUTEN-3-YNIDE: Explosion.
SODIUM: Spontaneous ignition.
SODIUM AZIDE: Exothermic reaction.
SODIUM HYDROXIDE: Temperature and pressure increase in a closed container.
STIBINE: Explosive reaction.
SUCROSE (SOLID): Vigorous reaction.

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SULFAMIC ACID: Violent reaction with evolution of toxic nitrous oxide.
SULFIDES: Reacts.
SULFUR DIOXIDE: Explosive reaction.
SULFUR HALIDES: Violent reaction.
SULFURIC ACID + GLYCERIDES: Explosive reaction.
SULFURIC ACID + TEREPHTHALIC ACID: Violent reaction.
SURFACTANTS + PHOSPHORIC ACID: Explosion hazard.
TERPENES: Spontaneous ignition.
TETRABORANE: Explosive reaction.
TETRABORANE DECAHYDRIDE: Explosive reaction.
TETRAPHOSPHOROUS DIODOTRISSELENIIDE: Explosive reaction.
TETRAPHOSPHOROUS IODIDE: Ignites on contact.
TETRAPHOSPHOROUS TETRAOXIDE TRISULFIDE: Violent reaction.
THIOALDEHYDES: Violent reaction.
THIOKETONES: Violent reaction.
THIOPHENES: Explosive reaction.
TITANIUM: Forms shock-sensitive compound.
TITANIUM ALLOYS: Possible explosive reaction.
TITANIUM-MAGNESIUM ALLOY: Possible explosion on impact.
TOLUENE: Violent reaction.
TOLUIDENE: Ignition reaction.
1,3,5-TRIACETYLHEXAHYDRO-1,3,5-TRIAZINE + TRIFLUOROACETIC ANHYDRIDE: Explosive reaction.
TRIAZINE: Violently explosive reaction.
TRICADMIUM DIPHOSPHIDE: Explosive reaction.
TRIETHYLGALLIUM MONOETHYL ETHER COMPLEX: Ignition reaction.
TRIMETHYLTROXANE: Intense reaction.
TRIS(IODOMERCURI)PHOSPHINE: Violent decomposition.
TRITHIOACETONE: Explosive reaction.
TURPENTINE: Explosive mixture.
UNSYMMETRICAL DIMETHYL HYDRAZINE: Spontaneous ignition.
URANIUM: Explosive reaction.
URANIUM ALLOY: Violent reaction.
URANIUM DISULFIDE: Violent reaction.
URANIUM-NEODYMIUM ALLOYS: Explosive reaction.
VINYL ACETATE: Temperature and pressure increase in closed container.
VINYLIDENE CHLORIDE: Temperature and pressure increase in closed container.
WOOD: Possible ignition.
P-XYLENE: Intense reaction in presence of sulfuric acid.
ZINC: Incandescent reaction.
ZINC ETHOXIDE: Possible explosion.
ZIRCONIUM-URANIUM ALLOYS: Explosive reaction

ARSENIC TRIOXIDE, SOLID:
ACIDS: Vigorous reaction.
ALUMINIUM: Corrosive in the presence of moisture.
CHLORINE TRIFLUORIDE: Violent reaction with possible ignition.
COPPER: Corrosive in the presence of moisture.
FLUORINE: Violent reaction.
HYDROGEN FLUORIDE: Reacts with incandescence.
IRON SOLUTIONS: Corrodes.
MERCURY: Vigorous reaction.
METALS: Corrosive in the presence of moisture.
OXYGEN DIFLUORIDE: Vigorous reaction.
RUBIDIUM CARBIDE: Ignites.
SODIUM CHLORATE: Forms spontaneously flammable mixture.
SODIUM NITRATE + IRON(II) SULFATE: Spontaneous ignition.
ZINC: Explodes when heated.

DECOMPOSITION:
Thermal decomposition products may include toxic and hazardous oxides of nitrogen and arsine gas.

POLYMERIZATION:
Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

STORAGE AND DISPOSAL

Observe all federal, state and local regulations when storing or disposing of this substance.

Disposal

Arsenic - Regulatory level 5.0 mg/l (TCLP-40 CFR 261 Appendix II)
materials which contain the above substance at or above the TCLP regulatory level meet the EPA toxicity characteristic, and must be disposed of in accordance with 40 CFR part 262. EPA Hazardous Waste Number D004

CONDITIONS TO AVOID

May burn but does not ignite readily. May ignite combustibles (wood, paper, oil, etc.).

SPILL AND LEAK PROCEDURES

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OCCUPATIONAL SPILL:

Do not touch spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors. For small spills, take up with sand or other absorbent material and place into containers for later disposal. For larger spills, dike spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry.

PROTECTIVE EQUIPMENT

VENTILATION:

Provide local exhaust or process enclosure ventilation to meet published exposure limits.

Arsenic (inorganic):

Ventilation should meet the requirements in 29 CFR 1910.1018(g).

RESPIRATOR:

The following respirators are the minimum legal requirements as set forth by the Occupational Safety and Health Administration found in 29 CFR 1910, Subpart Z.

Respiratory protection for inorganic arsenic particulate except those with significant vapor pressure

Concentration of inorganic arsenic (As) Required respirator
or condition of use

Unknown or greater or less than 20,000 ug/m3 (20 mg/m3) or firefighting Any full facepiece, self contained breathing apparatus, operated in positive pressure mode.

Not greater than 20,000 ug/m3 (20 mg/m3) Supplied-air respirator with full facepiece, hood or helmet or suit and operated in positive pressure mode.

Not greater than 10,000 ug/m3 (10 mg/m3) Powered-air purifying respirators in all inlet face coverings with high efficiency filters;
or
Half-mask supplied-air respirator operated in positive pressure mode.

Not greater than 500 ug/m3 Full facepiece air-purifying respirator equipped with high efficiency filters;
or
Any full facepiece supplied-air respirator;
or
Any full facepiece self-contained breathing apparatus.

Not greater than 100 ug/m3 Half-mask air-purifying respirator equipped with high efficiency filters;
or
Any half-mask supplied-air respirator.

(High efficiency filter- 99.97% efficiency against 0.3 micrometer monodisperse diethyl-hexyl phthalate (DOP) particles)

Respiratory protection for inorganic arsenicals (such as arsenic trichloride or arsenic phosphide) with significant vapor pressure.

Concentration of inorganic arsenic (As) Required respirator
or condition of use

Unknown or greater or less than 20,000 ug/m3 (20 mg/m3) Any full facepiece self-contained breathing apparatus operated in positive pressure mode.

Not greater than 20,000 ug/m3 (20 mg/m3) Supplied-air respirator with a full facepiece, hood or helmet or suit operated in positive pressure mode.

Not greater than 10,000 ug/m3 (10 mg/m3) Half-mask supplied air respirator operated in positive pressure mode.

Not greater than 500 ug/m3 Front- or back-mounted gas mask equipped with high-efficiency filters and acid gas canister;
or
any full facepiece supplied air

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respirator;
or
Any full facepiece self-contained breathing apparatus.

Not greater than 100 ug/m3

Half-mask air-purifying respirator equipped with high efficiency filter and acid gas cartridge;
or
Any half-mask supplied-air respirator.

(High efficiency filter- 99.97% efficiency against 0.3 micrometer monodisperse diethyl-hexyl phthalate (DOP) particles)
(half-mask respirators shall not be used for protection against arsenic trichloride, as it is rapidly absorbed through the skin).

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

CLOTHING:

Employee must wear appropriate protective (impervious) clothing and equipment to prevent any possibility of skin contact with this substance.

ARSENIC (INORGANIC):

Protective clothing should meet the requirements for protective work clothing and equipment in 29 CFR 1910.1018(j).

GLOVES:

Employee must wear appropriate protective gloves to prevent contact with this substance.

ARSENIC (INORGANIC):

Protective gloves should meet the requirements for protective work clothing and equipment in 29 CFR 1910.1018(j).

EYE PROTECTION:

Employee must wear splash-proof or dust-resistant safety goggles and a faceshield to prevent contact with this substance.

Emergency wash facilities:

Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.

ARSENIC (INORGANIC):

Protective eye equipment should meet the requirements for protective work clothing and equipment in 29 CFR 1910.1018(j).

AUTHORIZED - FISHER SCIENTIFIC, INC.
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- ADDITIONAL INFORMATION -
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MATERIAL SAFETY DATA SHEET

COMPLIES WITH STD. 29 CFR 1910.1200

S E C T I O N	MANUFACTURER'S NAME		EMERGENCY TELEPHONE NUMBERS		
	ADDRESS		(516) 333-5600		
	CHEMICAL NAME AND SYNONYMS			DATE OF LAST REVISION	
1	Barium metal			12/16/86	
	FORMULA		CHEMICAL FAMILY	CHEM. ABSTRACT NO	
	Ba		Metal	7440-39-3	
2	TSCA			CALC. MOLECULAR WEIGHT	
	Listed in TSCA inventory			137.34	
	HAZARDOUS INGREDIENTS				
3	HAZARDOUS INGREDIENTS		CAS #	%	TLV
	Barium		7440-39-3	100	.5ma/m ³
S E C T I O N	BOILING POINT (°C)		DENSITY (gm/cc)		
	1600		3.60		
	VAPOR PRESSURE		% VOLATILE BY VOLUME (%)		
	NA		NA		
	REACTION WITH WATER		EVAPORATION RATE (H ₂ O = 1)		
	Exothermic hydration with evolution of H ₂		NA		
	SOLUBILITY IN WATER		MELTING POINT (°C)		
S E C T I O N	APPEARANCE AND ODOR		710		
	OTHER COMMENTS		Silvery-gray metallic pieces; no odor		
	FLASH POINT (method used)		AUTOIGNITION TEMP. (°C)	FLAMMABILITY	Let
	NA		NA	A flammable solid	Uel
	EXTINGUISHING MEDIA		NA		
	Agents for metal fires such as dry graphite, MET-L-X or TEC.		NA		
	SPECIAL FIRE FIGHTING PROCEDURES		NA		
4	Do not use water on metal fires. Allow to burn or cover with Class D extinguishment. Wear full protective gear including SCBA unit.				
	UNUSUAL FIRE AND EXPLOSION HAZARDS				
	Dangerous and explosive in form of dust when exposed to heat or flame. Evolve flammable hydrogen gas in contact with water.				
S E C T I O N	TOXICITY DATA			HMIS HAZARD RATING	
	No data			HEALTH: 2	
				FLAMMABILITY: 2	
S E C T I O N				REACTIVITY: 1	
				PERSONAL PROTECTION: X	
S E C T I O N	ROUTE(S) OF ENTRY: INHALATION? X SKIN? X INGESTION?				
	EFFECTS OF OVEREXPOSURE (acute and chronic)				
	INHALATION: Soluble barium compounds cause irritation of the nose, throat and bronchi. The metal can be corrosive to mucous membranes. Long term exposure can lead to baritosis, a benign form of pneumoconiosis.				
S E C T I O N	DERMAL/ EYE CONTACT: May cause burns of the skin and eyes from direct contact of the metal.				
	OTHER (Specify): Ingestion of barium can cause gastricenteritis, muscular paralysis, vomiting, diarrhea, slow pulse, dizziness and ringing in the ears. A poison by ingestion.				
	MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE				
S E C T I O N	ND				
	CARCINOGENICITY None NTP? IARC MONOGRAPHS? OSHA REGULATED?				
	ND-NO DATA FOUND NA-NOT APPLICABLE				

BARIUM METAL

115240

S E C T I O N 5	EMERGENCY AND FIRST AID PROCEDURES		
	INGESTION: Give victim milk or water. Do not induce vomiting. Get immediate medical attention.		
	INHALATION: Remove to fresh air. Place individual under care of a physician.		
	SKIN CONTACT: Wash off material with copious amounts of water. Treat for burns as necessary.		
	EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Seek immediate medical attention.		
S E C T I O N 6	STABILITY	CONDITIONS CONTRIBUTING TO UNSTABILITY	
	STABLE	Exposure to moisture.	
	UNSTABLE X		
	INCOMPATIBILITY (materials to avoid)		
	Acids, CCl_4 , $\text{C}_2\text{Cl}_2\text{F}_2$, $\text{C}_2\text{H}_2\text{FCl}_3$, C_2Cl_4 , C_2HCl_3 , water		
	HAZARDOUS DECOMPOSITION PRODUCTS — THERMAL AND OTHER (list)		
S E C T I O N 7	Corrosive barium compounds		
	HAZARDOUS POLYMERIZATION	CONDITIONS TO AVOID	
	MAY OCCUR	Water, open flames, ignition sources.	
	WILL NOT OCCUR X		
S E C T I O N 8	STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED		
	Don appropriate protective equipment. Cover spill with sand or graphite. Scoop up and place in a container for disposal as described below.		
S E C T I O N 9	WASTE DISPOSAL METHOD (Consult federal, state or local authorities for proper disposal procedures.)		
	Don appropriate protective equipment. In a well vented hood, slowly add the barium waste to dry butanol or propan-2-ol. Allow to react. Evaporate off alcohol, then dispose of solid waste in an approved hazardous waste disposal site.		
	RESPIRATORY PROTECTION (specify type). USE ONLY NIOSH APPROVED EQUIPMENT.		
	Respirator approved for dusts, mists and fumes.		
	VENTILATION (Always maintain exposure below permissible limits.)	LOCAL EXHAUST Handle in well vented hood only if metal pieces are oil coated	SPECIAL Handle in glovebox under argon.
		MECHANICAL (general) Not recommended	OTHER May also be handled in open if immersed in oil.
	PROTECTIVE GLOVES Neoprene, rubber		EYE PROTECTION Goggles, face shield
	OTHER PROTECTIVE EQUIPMENT/WORK PRACTICES Wear protective outerwear to prevent skin contact or contamination of clothing.		
S E C T I O N 9	PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING		
	A flammable solid. Store under argon or immersed in oil. Keep away from sources of ignition. Keep storage container in a cool, dry location.		
S E C T I O N 9	TRANSPORTATION REQUIREMENTS		
	DOT CLASS: Not classified		
	UN NUMBER: 1400		
	IMCO CLASS: 4.3		
OTHER: A flammable solid			

The above information is believed to be accurate and represents the best information currently available to us. However, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OF IMPLIED, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

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MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY CONTACTS:
GASTON L. PILLORI: (201) 796-7100
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CHEMTREC ASSISTANCE: (800) 429-9300

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 7440-43-9

SUBSTANCE: ***CADMIUM***

TRADE NAMES/SYNONYMS:

CADMIUM DUST; C.I. NO. 77180; C-3; C-565; ACC03720

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: CD

MOLECULAR WEIGHT: 112.40

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=3 REACTIVITY=2 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=2

COMPONENTS AND CONTAMINANTS

COMPONENT: CADMIUM

PERCENT: <100.0

OTHER CONTAMINANTS: ZINC, COPPER, LEAD, TIN, SILVER, ANTIMONY,
ARSENIC, THALLIUM

EXPOSURE LIMITS:

CADMIUM:

* OSHA EXPOSURE LIMIT REMOVED AS PER OSHA INSTRUCTION PUB 8-1.4

0.05 MG(CD)/M3 ACGIH TWA (DUST, SALTS)

(NOTICE OF INTENDED CHANGES 1987-1988)

0.05 MG(CD)/M3 ACGIH CEILING LIMIT (CADMIUM OXIDE FUME)

(NOTICE OF INTENDED CHANGES 1987-1988)

LOWEST FEASIBLE LIMIT NIOSH RECOMMENDED EXPOSURE CRITERIA

SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY

WARNING AND RELEASE REQUIREMENTS- (OCTOBER 1, 1987)

CADMIUM:

1 POUND CERCLA SECTION 103 REPORTABLE QUANTITY

PHYSICAL DATA

DESCRIPTION: SOFT, DUCTILE, MALLEABLE SILVER-WHITE, BLUE-TINGED, LUSTROUS

METAL OR GRAYISH-WHITE POWDER BOILING POINT: 1409 F (765 C)

MELTING POINT: 610 F (321 C) SPECIFIC GRAVITY: 8.64

VAPOR PRESSURE: 1 MMHG @ 394 C SOLUBILITY IN WATER: INSOLUBLE

SOLVENT SOLUBILITY: ACIDS, AMMONIUM NITRATE SOLUTION, HOT SULFURIC ACID

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:

THE FINELY DIVIDED METAL IS PYROPHORIC; THE DUST IS A SEVERE FIRE HAZARD AND MODERATE EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME. THE SUBSTANCE REACTS VIOLENTLY WITH EXTINGUISHING AGENTS SUCH AS WATER, FOAM, CARBON DIOXIDE AND HALONS.

FLASH POINT: FLAMMABLE (DUST)

FIREFIGHTING MEDIA:

USE DRY SAND, DOLOMITE, GRAPHITE, SODIUM CHLORIDE, SODA ASH, OR APPROPRIATE METAL-EXTINGUISHING POWDER. DO NOT APPLY WATER TO BURNING MATERIAL (NFPA FIRE PROTECTION HANDBOOK, 16TH EDITION).

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FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. DO NOT SCATTER SPILLED MATERIAL WITH HIGH PRESSURE WATER STREAMS. DIKE FIRE CONTROL WATER FOR LATER DISPOSAL (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 31).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
*FLAMMABLE SOLID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND 172.402:
*FLAMMABLE SOLID

*HAZARD CLASSIFICATION AND LABEL APPLY TO DUST AND POWDER FORM ONLY.

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.154
EXCEPTIONS: 49CFR173.153

TOXICITY

CADMIUM:

TOXICITY DATA: 88 UG/M3/8.6 YEAR INHALATION-MAN TCLO; 39 MG/M3/20 MINUTES INHALATION-HUMAN LCLO; 15 MG/KG UNREPORTED-MAN LDLO; 225 MG/KG ORAL-RAT LD50; 25 MG/M3/30 MINUTES INHALATION-RAT LC50; 890 MG/KG ORAL-MOUSE LD50; 170 MG/M3 INHALATION-MOUSE LCLO; 70 MG/KG ORAL-RABBIT LDLO; 4 MG/KG INTRAPERITONEAL-RAT LD50; 9 MG/KG SUBCUTANEOUS-RAT LD50; 6 MG/KG SUBCUTANEOUS-RABBIT LDLO; 1800 UG/KG INTRAVENOUS-RAT LD50; 1140 MG/KG UNREPORTED-RAT LD50; 5 MG/KG INTRAVENOUS-RABBIT LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: ANTICIPATED HUMAN CARCINOGEN (NTP); HUMAN LIMITED EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS 2A). CADMIUM HAS PRODUCED LOCAL SARCOMAS IN RATS FOLLOWING INTRAMUSCULAR ADMINISTRATION. EXPOSURE TO CADMIUM, PRIMARILY AS THE OXIDE, HAS BEEN ASSOCIATED WITH INCREASED RISKS OF PROSTATIC AND RESPIRATORY CANCERS.
LOCAL EFFECTS: IRRITANT- EYE, SKIN, MUCOUS MEMBRANES.
ACUTE TOXICITY LEVEL: HIGHLY TOXIC BY INHALATION; TOXIC BY INGESTION.
TARGET EFFECTS: POISONING MAY AFFECT THE KIDNEYS, BONE, BLOOD LIVER, LUNGS AND THE RESPIRATORY, NERVOUS, CARDIOVASCULAR AND GASTROINTESTINAL SYSTEMS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH KIDNEY, LIVER OR RESPIRATORY, DISORDERS.
ADDITIONAL DATA: DRUG METABOLIZING ENZYMES MAY BE INHIBITED. EYE AND RESPIRATORY IRRITATION ARE NOT SUFFICIENT WARNING PROPERTIES FOR SYSTEMIC AND RESPIRATORY DAMAGE. IRON OR CALCIUM DEFICIENCY MAY INCREASE THE ABSORPTION OF CADMIUM.

HEALTH EFFECTS AND FIRST AID

INHALATION:

CADMIUM:

IRRITANT/HIGHLY TOXIC.

ACUTE EXPOSURE- THE AVERAGE CONCENTRATION RESPONSIBLE FOR FATALITIES IS 40-50 MG/M3 FOR 1 HOUR OR 9 MG/M3 FOR 5 HOURS. EARLY SYMPTOMS MAY INCLUDE MILD IRRITATION OF THE UPPER RESPIRATORY TRACT, A SENSATION OF CONSTRICTION OF THE THROAT, A NASTY OR METALLIC TASTE IN THE MOUTH AND COUGH. A LATENT PERIOD FROM 1-10 HOURS MAY PRECEDE THE ONSET OF RAPIDLY PROGRESSING DYSPNEA, CYANOSIS, SUBSTERNAL OR PRECORDIAL CHEST PAIN, AND A FLU-LIKE SYNDROME WITH WEAKNESS, MALAISE, NAUSEA, VOMITING, HEADACHE, FEVER, CHILLS, SHIVERING, PROFUSE SWEATING, AND MUSCULAR PAINS IN THE BACK AND LIMBS. COUGH WITH FOAMY OR BLOODY SPUTUM AND PULMONARY RALES MARK THE ONSET OF ACUTE PULMONARY EDEMA WHICH USUALLY DEVELOPS WITHIN 24 HOURS AND REACHES A MAXIMUM BY 3 DAYS. IF DEATH FROM ASPHYXIA DOES NOT OCCUR, AND EXPOSURE WAS MILD, SYMPTOMS MAY RESOLVE WITHIN A WEEK. IN MORE SEVERE EXPOSURES, FEVER, COUGH, CHEST PAIN, DYSPNEA, AND PROLIFERATIVE INTERSTITIAL PNEUMONITIS MAY PERSIST FROM 3-10 DAYS. PERMANENT PULMONARY FIBROSIS AND HYPERTROPHY OF BRONCHIAL VESSELS MAY OCCUR. THE FATALITY RATE HAS BEEN ESTIMATED TO BE BETWEEN 15-20%. ACUTE RENAL NECROSIS AND/OR LIVER DAMAGE MAY DEVELOP FOLLOWING MASSIVE ACUTE EXPOSURE. SEQUELAE FROM NON-FATAL EXPOSURE MAY INCLUDE MICROCYTIC, HYPOCHROMIC ANEMIA, TESTICULAR ATROPHY, CARDIOVASCULAR EFFECTS, EMPHYSEMA, ANEMIA, TERATOGENIC EFFECTS AND OSTEOMALACIA.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE RENAL TUBULAR DAMAGE WITH KIDNEY LESIONS, PROTEINURIA, AMINO-ACIDURIA, GLUCOSURIA AND PHOSPHATURIA. AS KIDNEY DYSFUNCTION CONTINUES, MINERALS SUCH AS CALCIUM AND PHOSPHORUS ARE LOST IN THE URINE, AND MAY ACCOUNT FOR BONE DEMINERALIZATION AND THE PREVALENT FORMATION OF KIDNEY STONES. AS A RESULT, OSTEOMALACIA, OSTEOPOROSIS, AND SPONTANEOUS FRACTURES MAY OCCUR AND BE MANIFESTED AS BACK PAIN, PAIN IN THE EXTREMITIES, DIFFICULTY IN WALKING, AND PAIN ON BONE PRESSURE. CADMIUM-INDUCED KIDNEY DAMAGE IS IRREVERSIBLE AND MAY GROW WORSE EVEN WHEN EXPOSURE CEASES. IRREVERSIBLE LUNG INJURY OF THE EMPHYSEMATOUS TYPE WITH COUGH AND SHORTNESS OF BREATH, ABNORMAL LUNG FUNCTION, AIRWAYS OBSTRUCTION AND POSSIBLY PULMONARY FIBROSIS. OTHER EFFECTS MAY INCLUDE ULCERATION OF THE NASAL SEPTUM, DAMAGE OF THE OLFACTORY NERVE AND ANOSMIA, HEMOLYTIC AND IRON-DEFICIENCY

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ANEMIA, WEIGHT LOSS, IRRITABILITY AND A YELLOW CADMIUM FRINGE ON THE TEETH. SOME STUDIES SUGGEST A RELATIONSHIP BETWEEN CADMIUM LEVELS IN AIR AND HUMAN CARDIOVASCULAR DISEASE AND HYPERTENSION, BUT CAUSAL ASSOCIATION HAS NOT BEEN PROVEN. LONG-TERM SEQUELAE MAY INCLUDE RENAL TUBULAR NECROSIS, CARDIOVASCULAR EFFECTS, LIVER DAMAGE, ANEMIA, EMPHYSEMA AND OSTEOMALCIA. OCCUPATIONAL EXPOSURE TO CADMIUM IS IMPLICATED IN A SIGNIFICANT INCREASE IN THE INCIDENCE OF PROSTATIC, RESPIRATORY AND RENAL CANCERS.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

CADMIUM:
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT MAY RESULT IN IRRITATION.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY RESULT IN DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

CADMIUM:
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE REDNESS OR PAIN, BUT NO INJURY HAS BEEN REPORTED.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

CADMIUM:
TOXIC.

ACUTE EXPOSURE- CADMIUM IS A POWERFUL EMETIC WHICH INDUCES VOMITING SO THAT LESS IS RETAINED AND ABSORBED. IF SUFFICIENT AMOUNTS ARE ABSORBED SYSTEMIC TOXICITY MAY OCCUR. SYMPTOMS, WHICH MAY BEGIN 15 MINUTES TO 1 HOUR AFTER INGESTION ARE SALIVATION, CHOKING, SEVERE NAUSEA, PERSISTENT VOMITING, DIARRHEA, TENESMUS, ABDOMINAL PAIN, BLURRED VISION, DIZZINESS, VERTIGO, HEADACHE, MUSCULAR CRAMPS AND RARELY, CONVULSIONS, EXHAUSTION, COLLAPSE, SHOCK AND UNCONSCIOUSNESS. IF DEATH OCCURS, IT IS USUALLY WITHIN 24 HOURS FROM SHOCK DUE TO FLUID LOSS, OR, IT MAY BE DELAYED 7-14 DAYS AND RESULT FROM ACUTE RENAL FAILURE OR CARDIOPULMONARY DEPRESSION. IF VICTIM SURVIVES, DELAYED LIVER AND/OR KIDNEY DAMAGE MAY OCCUR. A DOSE EXCEEDING 300 MG MAY BE FATAL.

CHRONIC EXPOSURE- PROLONGED LOW LEVEL EXPOSURE MAY CAUSE IRREVERSIBLE RENAL TUBULAR DYSFUNCTION AND/OR GLOMERULAR INJURY WITH PROTEINURIA WHICH MAY PROGRESS TO AMINO-ACIDURIA, GLUCOSURIA AND PHOSPHATURIA. AS KIDNEY DYSFUNCTION CONTINUES, MINERALS SUCH AS CALCIUM AND PHOSPHORUS ARE LOST IN THE URINE AND MAY ACCOUNT FOR BONE DEMINERALIZATION AND THE PREVALENT FORMATION OF KIDNEY STONES. AS A RESULT, OSTEOMALACIA, OSTEOPOROSIS AND SPONTANEOUS FRACTURES MAY OCCUR AND BE MANIFESTED AS BACK PAIN, PAIN IN THE EXTREMITIES, DIFFICULTIES IN WALKING, AND PAIN ON BONE PRESSURE. CADMIUM-INDUCED KIDNEY DAMAGE IS IRREVERSIBLE AND MAY GROW WORSE EVEN WHEN EXPOSURE CEASES. ANIMAL EXPERIMENTS INDICATE ANTAGONISTIC ACTIVITY BETWEEN CADMIUM AND ZINC SUCH THAT ABNORMAL ZINC METABOLISM WAS FOUND TO CONTRIBUTE SIGNIFICANTLY TO THE TOXIC SYNDROME FOLLOWING PROLONGED INGESTION OF CADMIUM. FUNCTIONAL CHANGES IN THE LIVER, PANCREAS AND ADRENAL GLANDS WHICH ALTER GLUCOSE METABOLISM MAY OCCUR. ALTHOUGH INCONCLUSIVE, SOME STUDIES SUGGEST A RELATIONSHIP BETWEEN PROLONGED EXPOSURE TO CADMIUM AND HUMAN CARDIOVASCULAR DISEASE AND HYPERTENSION. A STUDY WHICH SUPPORTS THIS THEORY WAS REPORTED WHERE FEMALE RATS EXHIBITED HYPERTENSION AFTER CHRONICALLY INGESTING CADMIUM THROUGH THEIR DRINKING WATER. REPRODUCTIVE EFFECTS SUCH AS CONGENITAL ABNORMALITIES, INCREASED MORTALITY, AND REDUCED RATES OF GROWTH HAVE BEEN FOUND IN EXPERIMENTAL ANIMALS AFTER PROLONGED INGESTION OF CADMIUM.

FIRST AID- GIVE MILK OR BEATEN EGGS EVERY 4 HOURS TO RELIEVE GASTROINTESTINAL IRRITATION. REMOVE UNABSORBED CADMIUM BY CATHARSIS WITH FLEET'S PHOSPHO-SODA, 30-60 ML DILUTED 1:4 IN WATER. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.) TREATMENT MUST BE ADMINISTERED MEDICAL PERSONNEL.

ANTIDOTE:

THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

CADMIUM POISONING:

DO NOT GIVE DIMERCAPROL. IF SYMPTOMS PERSIST, THE ADMINISTRATION OF CALCIUM DISODIUM EDETATE IS RECOMMENDED. GIVE 15-25 MG/KG (0.08-0.125 ML OF 20% SOLUTION PER KILOGRAM OF BODY WEIGHT) IN 250-500 ML OF 5% DEXTROSE

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INTRAVENOUSLY OVER A 1 TO 2 HOUR PERIOD, TWICE DAILY. THE MAXIMUM DOSE SHOULD NOT EXCEED 50 MG/KG/DAY. THE DRUG SHOULD BE GIVEN IN 5-DAY COURSES WITH A REST PERIOD OF AT LEAST 2 DAYS BETWEEN COURSES. AFTER THE FIRST COURSE, SUBSEQUENT COURSES SHOULD NOT EXCEED 50 MG/KG/DAY. DAILY URINALYSES SHOULD BE DONE DURING THE TREATMENT PERIOD. THE DOSAGE SHOULD BE REDUCED IF ANY UNUSUAL URINARY FINDINGS APPEAR. INTRAVENOUS ADMINISTRATION IS CONTRA-INDICATED IN THE PRESENCE OF ELEVATED CEREBROSPINAL FLUID PRESSURE. FOR INTRAMUSCULAR ADMINISTRATION, GIVE 20% SOLUTION (200 MG/ML), 12.5 MG/KG BODY WEIGHT EVERY 4-6 HOURS. DILUTE EACH DOSE WITH AN EQUAL VOLUME OF 1% PROCAINE. DOSE LIMITATION IS THE SAME AS THAT GIVEN ABOVE (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

REACTIVITY

REACTIVITY:

CADMIUM:

STABLE WHEN KEPT IN SEALED CONTAINERS UNDER NORMAL TEMPERATURES AND PRESSURES, BUT DUST MAY IGNITE UPON CONTACT WITH AIR. METAL TARNISHES IN MOIST AIR. REACTS VIOLENTLY WITH WATER.

INCOMPATIBILITIES:

CADMIUM:

AMMONIUM NITRATE (FUSED): VIOLENT OR EXPLOSIVE REACTION.

HYDRAZOIC ACID: MAY EXPLODE VIOLENTLY.

NITRIL FLUORIDE: INCANDESCENT REACTION WHEN HEATED SLIGHTLY.

OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.

SELENIUM: EXOTHERMIC REACTION.

SULFUR: FIRE AND EXPLOSION HAZARD.

TELLURIUM: INCANDESCENT REACTION IN HYDROGEN ATMOSPHERE.

ZINC: INTENSE EXOTHERMIC REACTION.

DECOMPOSITION:

CADMIUM:

THE HEATED METAL RAPIDLY FORMS HIGHLY TOXIC, BROWNISH FUMES OF OXIDES OF CADMIUM.

POLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

CONDITIONS TO AVOID

MAY IGNITE ITSELF IF EXPOSED TO AIR AND MAY RE-IGNITE AFTER FIRE IS EXTINGUISHED. MAY BURN RAPIDLY WITH FLARE-BURNING EFFECT. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:

DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. DO NOT GET WATER INSIDE CONTAINER. FOR SMALL SPILLS, FLUSH AREA WITH FLOODING AMOUNTS OF WATER. FOR LARGER SPILLS, DIKE SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 1 POUND

THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:

PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS, OR DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.

THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

AT ANY DETECTABLE CONCENTRATION:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.
SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED

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IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH HIGH-EFFICIENCY
PARTICULATE FILTER.
ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE
DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND
OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY
SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER
POSITIVE PRESSURE MODE.

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT
TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS
SUBSTANCE.

EYE PROTECTION:

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT
EYE CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 12/03/84 REVISION DATE: 03/15/89

-ADDITIONAL INFORMATION-

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CHROMIUM
CHROMIUM
CHROMIUM

MATERIAL SAFETY DATA SHEET

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 7440-47-3

SUBSTANCE: ***CHROMIUM***

TRADE NAMES/SYNONYMS:
CHROME, /CHROMIUM METAL; C-317; C-318; ACC05000

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: CR

MOLECULAR WEIGHT: 52

CERCLA RATINGS (SCALE 0-3): HEALTH=U FIRE=U REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=U FIRE=U REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: CHROMIUM

PERCENT: 99.5

OTHER CONTAMINANTS: SULFUR, CARBON, SILICON, OXYGEN, IRON

EXPOSURE LIMITS:
CHROMIUM:

1 MG/M3 OSHA TWA
0.5 MG/M3 ACGIH TWA

1 POUND CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: ODORLESS, SHINY METAL OR STEEL-GRAY POWDER.

BOILING POINT: 4784 F (2672 C) MELTING POINT: 3375 F (1857 C)

SPECIFIC GRAVITY: 7.2 @ 28 C SOLUBILITY IN WATER: INSOLUBLE

SOLVENT SOLUBILITY: ACIDS (EXCEPT NITRIC), STRONG ALKALIES

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLECTIBLE FIRE HAZARD IN METALLIC FORM; HOWEVER, POSSIBLE FIRE AND EXPLOSION HAZARD IN DUST FORM WHEN EXPOSED TO HEAT OR FLAME.

UPPER EXPLOSIVE LIMIT: NOT AVAILABLE LOWER EXPLOSIVE LIMIT: 0.230%

AUTOIGNITION TEMP.: 752 F (400 C) (DUST)

FIREFIGHTING MEDIA:
FOR SMALL FIRES, USE DRY SAND, DRY DOLOMITE, OR DRY GRAPHITE. FOR LARGE FIRES, EXTINGUISH WITH WATER SPRAY, FOG, DRY CHEMICAL, CARBON DIOXIDE, OR SAND.

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. DO NOT SCATTER SPILLED MATERIAL WITH HIGH PRESSURE WATER STREAMS. DIKE FIRE CONTROL WATER FOR LATER DISPOSAL (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 31).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

TOXICITY

110955

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CHROMIUM:
TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL INADEQUATE EVIDENCE (IARC CLASS-3). THERE IS SUFFICIENT EVIDENCE OF RESPIRATORY CARCINOGENICITY IN MEN OCCUPATIONALLY EXPOSED DURING CHROMATE PRODUCTION. THE EPIDEMIOLOGICAL DATA DO NOT ALLOW AN EVALUATION OF THE RELATIVE CONTRIBUTIONS TO CARCINOGENIC RISK OF METALLIC CHROMIUM, CHROMIUM(III), AND CHROMIUM(VI) OR OF SOLUBLE VERSUS INSOLUBLE CHROMIUM COMPOUNDS.

THERE IS INSUFFICIENT DATA TO QUANTIFY THE TOXICITY OF CHROMIUM METAL.
POISONING BY SOME CHROMIUM COMPOUNDS MAY AFFECT THE LIVER AND KIDNEYS.

HEALTH EFFECTS AND FIRST AID

INHALATION:

CHROMIUM:

500 MG(CR)/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- HIGH CONCENTRATIONS OF DUSTS OR FUMES MAY CAUSE IRRITATION.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO SOME CHROMIUM COMPOUNDS MAY RESULT IN ULCERATION AND PERFORATION OF THE NASAL SEPTUM, SHORT-TERM MEMORY AND ATTENTION SPAN DISTURBANCES, GASTROINTESTINAL DISTURBANCES, PULMONARY SENSITIZATION, PULMONARY FIBROSIS OR PNEUMOCONIOSIS, AND ACUTE HEPATITIS WITH JAUNDICE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

CHROMIUM:

ACUTE EXPOSURE- CONTACT WITH DUSTS OF CHROMIUM COMPOUNDS MAY CAUSE IRRITATION.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO SOME CHROMIUM COMPOUNDS MAY RESULT IN "CHROME HOLES", SENSITIZATION, AND KIDNEY LESIONS. ALLERGIC CONTACT DERMATITIS DUE TO CONTACT WITH CHROME-PLATED OBJECTS IS USUALLY FOUND TO BE DUE TO THE PRESENCE OF NICKEL.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

CHROMIUM:

ACUTE EXPOSURE- CONTACT WITH DUSTS OF CHROMIUM COMPOUNDS MAY CAUSE IRRITATION.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH SOME CHROMIUM COMPOUNDS MAY CAUSE CONJUNCTIVITIS AND LACRIMATION.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

CHROMIUM:

ACUTE EXPOSURE- CHROMIUM METAL IS POORLY ABSORBED BY THE INTESTINAL TRACT. ABSORPTION OF SUFFICIENT AMOUNTS OF CHROMIUM COMPOUNDS MAY RESULT IN DIZZINESS, INTENSE THIRST, ABDOMINAL PAIN, VOMITING, SHOCK, OLIGURIA OR ANURIA, AND DEATH FROM UREMIA.

CHRONIC EXPOSURE- EXCESSIVE INGESTION OF SOME CHROMIUM COMPOUNDS MAY RESULT IN KIDNEY DAMAGE.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:

THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

CHROMIUM POISONING:

USE OF DIMERCAPROL HAS BEEN SUGGESTED ON THE BASIS OF FINDINGS IN ANIMALS. GIVE 3 MG/KG (OR 0.3 ML/10 KG) EVERY 4 HOURS, INTRAMUSCULARLY FOR THE FIRST 2 DAYS AND THEN 2 MG/KG EVERY 12 HOURS FOR A TOTAL OF 10 DAYS (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

REACTIVITY

REACTIVITY:

STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:

CHROMIUM:

ALKALI CARBONATES: ATTACKED.
ALKALIES (CAUSTIC): ATTACKED.

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AMMONIUM NITRATE (FUSED): VIOLENT OR EXPLOSIVE REACTION.
BROMINE PENTAFLUORIDE: VIOLENT REACTION AND POSSIBLE IGNITION.
HYDROGEN PEROXIDE: VIOLENT DECOMPOSITION REACTION.
LITHIUM (MOLTEN): VIGOROUS REACTION AT ELEVATED TEMPERATURES.
NITROGEN OXIDE: INCANDESCENT REACTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
POTASSIUM CHLORATE (FUSED): VIGOROUS INCANDESCENT REACTION.
SULPHUR DIOXIDE: INCANDESCENT REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC CHROMIC OXIDE.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

CONDITIONS TO AVOID

MAY BE IGNITED BY HEAT, SPARKS OR FLAMES. MAY BURN RAPIDLY WITH FLARE-BURNING EFFECT.

AVOID DISPERSION OF DUST IN AIR. FINELY DIVIDED PARTICLES, DUST, OR FUMES MAY BE FLAMMABLE OR EXPLOSIVE. KEEP AWAY FROM SPARKS OR IGNITION SOURCES.

SPILL AND LEAK PROCEDURES

SOIL SPILL:
DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

USE PROTECTIVE COVER SUCH AS A PLASTIC SHEET TO PREVENT MATERIAL FROM DISSOLVING IN FIRE EXTINGUISHING WATER OR RAIN.

WATER SPILL:
USE ACTIVATED CARBON TO ABSORB SPILLED SUBSTANCE THAT IS DISSOLVED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES. DO NOT TOUCH SPILLED MATERIAL. FOR SMALL SPILLS, WITH CLEAN SHOVEL, PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, WET DOWN WITH WATER AND DIKE FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

REPORTABLE QUANTITY (RQ): 1 POUND
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS; OR DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

CHROMIUM, METAL AND INSOLUBLE SALTS (AS CR):

2.5 MG(CR)/M3- ANY DUST AND MIST RESPIRATOR EXCEPT SINGLE-USE RESPIRATOR.

5 MG(CR)/M3- ANY DUST AND MIST RESPIRATOR EXCEPT SINGLE-USE AND
QUARTER-MASK RESPIRATOR.
ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.

12.5 MG(CR)/M3- ANY POWERED AIR-PURIFYING RESPIRATOR WITH A DUST AND MIST
FILTER.
ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW
MODE.

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25 MG(CR)/M3- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FACEPIECE AND A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

500 MG(CR)/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 10/25/84 REVISION DATE: 03/15/89

-ADDITIONAL INFORMATION-

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110972

***COBALT**
***COBALT**
***COBALT**

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE (800) 424-9300

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SUBSTANCE IDENTIFICATION

SUBSTANCE: **COBALT** CAS-NUMBER 7440-48-4

TRADE NAMES/SYNONYMS:
C.I.77320; COBALT-59; C-363; COBALT ELEMENT; ACC05250

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: CO

MOLECULAR WEIGHT: 58.93

CERCLA RATINGS (SCALE 0-3): HEALTH-3 FIRE-3 REACTIVITY-0 PERSISTENCE-3
NFPA RATINGS (SCALE 0-4): HEALTH-1 FIRE-3 REACTIVITY-0

COMPONENTS AND CONTAMINANTS

COMPONENT: COBALT PERCENT: 100
CAS# 7440-48-4

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:

COBALT METAL, DUST, AND FUME (AS CO):
0.05 MG/M3 OSHA TWA
0.05 MG/M3 ACGIH TWA
(NOTICE OF INTENDED CHANGES 1992-93)
0.05 MG/M3 NIOSH RECOMMENDED TWA

MEASUREMENT METHOD: PARTICULATE FILTER; ACID; ATOMIC ABSORPTION
SPECTROMETRY; (NIOSH VOL III # 7027).

SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY
WARNING AND RELEASE REQUIREMENTS- (JULY 1, 1992)

**OSHA REVOKED THE FINAL RULE LIMITS OF JANUARY 19, 1989 IN RESPONSE TO THE
11TH CIRCUIT COURT OF APPEALS DECISION (AFL-CIO V. OSHA) EFFECTIVE
JUNE 30, 1993. SEE 29 CFR 1910.1000 (58 FR 35338)**

PHYSICAL DATA

DESCRIPTION: ODORLESS, SILVER GRAY OR BLUISH-WHITE SHINING, HARD, MAGNETIC,
DUCTILE, SOMEWHAT MALLEABLE METAL, HEXAGONAL OR CUBIC CRYSTALS OR BLACK
POWDER. BOILING POINT: 5198 F (2870 C) MELTING POINT: 2723 F (1495 C)
SPECIFIC GRAVITY: 8.92 SOLUBILITY IN WATER: INSOLUBLE
SOLVENT SOLUBILITY: SOLUBLE IN DILUTE NITRIC ACID, AND OTHER ACIDS
AUTOIGNITION TEMPERATURE (CLOUD): 1400 F (760 C)

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLEGIBLE FIRE HAZARD IN BULK FORM, HOWEVER, DUST, POWDER, OR FUMES ARE
FLAMMABLE OR EXPLOSIVE WHEN EXPOSED TO HEAT OR FLAMES.

FLASH POINT: FLAMMABLE (DUST)

AUTOIGNITION TEMP.: 698 F (370 C) (DUST OR POWDER)

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FIREFIGHTING MEDIA:
USE DRY SAND, DOLOMITE, GRAPHITE, SODIUM CHLORIDE, SODA ASH, OR APPROPRIATE
METAL-EXTINGUISHING POWDER. DO NOT APPLY WATER TO BURNING MATERIAL (NFPA
FIRE PROTECTION HANDBOOK, 16TH EDITION).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF YOU CAN DO IT WITHOUT RISK. APPLY COOLING
WATER TO SIDES OF CONTAINERS THAT ARE EXPOSED TO FLAMES UNTIL WELL AFTER FIRE
IS OUT. STAY AWAY FROM ENDS OF TANKS FOR MASSIVE FIRE IN CARGO AREA. USE
UNMANNED HOSE HOLDER OR MONITOR NOZZLES. IF THIS IS IMPOSSIBLE, WITHDRAW FROM
AREA AND LET FIRE BURN (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5,
GUIDE PAGE 32).

EXTINGUISH USING AGENT FOR TYPE OF FIRE. AVOID BREATHING FUMES FROM BURNING
MATERIAL.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49-CFR 172.101
*FLAMMABLE SOLID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49-CFR 172.101 AND
SUBPART E
*FLAMMABLE SOLID

*HAZARD CLASSIFICATION AND LABEL APPLY TO DUST AND POWDER FORM ONLY.

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS, 49-CFR 173.154
EXCEPTIONS: 49-CFR 173.153

TOXICITY

COBALT

TOXICITY DATA: 100 UG/M3/6 HOURS/13 WEEKS INTERMITTENT INHALATION-GUINEA PIG
TCLO, 8170 MG/KG ORAL-RAT LD50, 750 MG/KG ORAL-RABBIT LDLO, 25 MG/KG
INTRATRACHEAL-RAT LDLO, 100 MG/KG INTRAVENOUS RABBIT LDLO, 100 MG/KG
INTRAVENOUS-RAT LDLO, 100 MG/KG INTRAPERITONEAL MOUSE LDLO, 250 MG/KG
INTRAPERITONEAL-RAT LDLO, TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE
(FOR COBALT METAL POWDER) (IARC GROUP-2B FOR COBALT AND COBALT COMPOUNDS)
A SIGNIFICANT INCREASE IN THE RISK FOR LUNG CANCER WAS REPORTED AMONG
WORKERS IN COBALT PRODUCTION WHO WERE ALSO EXPOSED TO NICKEL AND ARSENIC
AND HARD-METAL WORKERS WITH DOCUMENTED EXPOSURE TO COBALT-CONTAINING DUSTS
A SIGNIFICANT INCREASE IN LUNG CANCER RISK WAS SEEN IN PEOPLE EXPOSED FOR
MORE THAN 10 YEARS WHOSE EXPOSURE HAD BEGUN MORE THAN 20 YEARS PREVIOUSLY
A NUMBER OF SINGLE CASES OF MALIGNANT TUMORS, MOSTLY SARCOMAS, HAVE BEEN
REPORTED AT THE SITE OF ORTHOPAEDIC IMPLANTS CONTAINING COBALT.
INTRAMUSCULAR AND INTRATHORACIC INJECTIONS OF COBALT METAL POWDER IN RATS
PRODUCED SARCOMAS AT THE INJECTION SITE.
LOCAL EFFECTS: IRRITANT: INHALATION, SKIN, EYE
ACUTE TOXICITY LEVEL: SLIGHTLY TOXIC BY INGESTION
TARGET EFFECTS: SENSITIZER: RESPIRATORY, DERMAL. POISONING MAY ALSO AFFECT
THE RESPIRATORY, GASTROINTESTINAL, CARDIOVASCULAR, ENDOCRINE AND NERVOUS
SYSTEMS.
AT INCREASED RISK FROM EXPOSURE. PERSONS WITH PRE-EXISTING RESPIRATORY OR
SKIN DISEASE
ADDITIONAL DATA: ALCOHOL MAY ENHANCE THE TOXIC EFFECTS

HEALTH EFFECTS AND FIRST AID

INHALATION

COBALT

IRRITANT/SENSITIZER

20 MG(CO)/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH
ACUTE EXPOSURE: MAY CAUSE UPPER RESPIRATORY TRACT IRRITATION, RHINITIS,
CONJUNCTIVITIS AND TRACHEITIS. SENSITIZATION REACTIONS MAY OCCUR IN
PREVIOUSLY EXPOSED INDIVIDUALS. AN OBLITERATIVE BRONCHIOLITIS ADENOMATOSIS
HAS BEEN PRODUCED IN GUINEA PIGS INTRATRACHEALLY INJECTED WITH THE DUST
AT DOSES OF 50, 25, AND 10 MG INTRATRACHEAL ADMINISTRATION OF
12.5 MG/KG CAUSED LETHARGY AND DEATH IN 15 MINUTES TO 8 HOURS.
CHRONIC EXPOSURE: PROLONGED OR REPEATED EXPOSURE MAY CAUSE RESPIRATORY
IRRITATION, DISCHARGE FROM RESPIRATORY OR DIGESTIVE MUCOUS MEMBRANES,
NASAL OBSTRUCTION, SNEEZING, CLEAR SECRETIONS SOMETIMES CONTAINING BLOOD,
AN INTENSE BURNING SENSATION WHEN SWALLOWING, EXERTIONAL DYSPNOEA,
GASTROINTESTINAL DISTRESS, APPETITE AND WEIGHT LOSS, PERIPHERAL NEURITIS,
HEADACHE, WEAKNESS, IRRITABILITY, PARTIAL OR COMPLETE LOSS OF THE SENSE OF
SMELL, AUDITORY NERVE PROBLEMS, AND AN INCREASED INCIDENCE OF SPONTANEOUS
ABORTIONS IN WOMEN WORKERS AND IN THE WIVES OF MEN WORKERS. SEVERAL CASES
OF CARDIOMYOPATHY HAVE BEEN REPORTED IN WORKERS. THE ONSET OF THE DISEASE
MAY BEGIN GRADUALLY WITH STEADILY INCREASING CHEST DISCOMFORT AND
SHARP PAINS NEAR THE HEART. OTHER SYMPTOMS MAY INCLUDE DRY COUGH, MUCOID
SPUTUM, GENERAL MALAISE, DROP IN BLOOD PRESSURE, RIGHT SIDED HEMIPARESIS,
SLEEPLESSNESS, AND WEIGHT LOSS. FRAGMENTED MYOCARDIAL FIBERS, VACUOLAR
CHANGE, DIFFUSED THICKENING OF THE ENDOCARDIUM AND ABSENCE OF AN
INFLAMMATORY REACTION WERE SIGNS OF CARDIOMYOPATHY. STUDIES FROM WORKERS
CHRONICALLY EXPOSED TO COBALT IN TUNGSTEN CARBIDE MANUFACTURING OF HARD
METAL REVEALED THREE TYPES OF RESPIRATORY DISEASE: AIRWAYS OBSTRUCTION

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MAY OCCUR FROM SIMPLE IRRITATION AND APPEARS TO BE RELATED TO AN ALLERGIC RESPONSE. IT HAS BEEN REPORTED TO OCCUR AT A LEVEL OF 0.08 MG/M3 AND IS CHARACTERIZED BY WHEEZING, COUGH, AND SHORTNESS OF BREATH WHILE AT WORK WITH SYMPTOMS IMPROVING WHEN EXPOSURE CEASES. THIS SYNDROME MAY NOT DEVELOP UNTIL 6 TO 18 MONTHS OF EXPOSURE HAS OCCURRED AND IS NOT THOUGHT TO BE PROGRESSIVE. HOWEVER ONCE SENSITIZED A WORKER COULD PROBABLY NOT TOLERATE INHALATION OF EVEN SMALL AMOUNTS; INTERSTITIAL PNEUMONITIS, A SYNDROME SIMILAR TO EXTRINSIC ALLERGIC ALVEOLITIS HAS BEEN REPORTED IN WORKERS. THE SIGNS AND SYMPTOMS ARE COMPATIBLE WITH TRANSIENT PNEUMONITIS. BASAL CRACKLES AND RADIOGRAPHIC ABNORMALITIES OCCUR BUT SYMPTOMS IMPROVE AND RESPIRATORY IMPAIRMENT IS DECREASED OR RESOLVED ONCE THE SUBJECT IS REMOVED FROM EXPOSURE FOR A PERIOD OF TIME. INTERSTITIAL FIBROSIS HAS BEEN OBSERVED TO OCCUR IN WORKERS EXPOSED TO 0.1 TO 0.2 MG/M3 FOR USUALLY 10 YEARS. SYMPTOMS INCLUDED COUGH, SCANTY MUCCOID SPUTUM, AND AND SHORTNESS OF BREATH WHICH PROGRESSIVELY WORSENS. TACHYPNEA IS FREQUENT AND CLUBBING OF THE DIGITS. AND BASAL CRACKLES ARE LATE FEATURES OF THIS CONDITION. PULMONARY FUNCTION IS DECREASED AND DEATH IS USUALLY DUE TO PULMONARY HYPERTENSION AND COR PULMONALE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

COBALT:
IRRITANT/SENSITIZER.

ACUTE EXPOSURE- MAY CAUSE IRRITATION. SENSITIZATION DERMATITIS MAY OCCUR IN PERSONS WHO HAVE BEEN PREVIOUSLY EXPOSED. BOTH URTICARIAL ERUPTIONS AND ERYTHEMATOUS PAPULAR TYPES HAVE BEEN DESCRIBED AND USUALLY OCCUR IN SKIN AREAS SUBJECTED TO FRICTION, SUCH AS THE ELBOW FLEXURES, ANKLES, AND NECK. CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY LEAD TO SENSITIZATION DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

COBALT:
IRRITANT.

ACUTE EXPOSURE- MAY CAUSE IRRITATION. WORKERS IN THE COBALT-CEMENTED TUNGSTEN INDUSTRY HAVE NOT EXPERIENCED EYE IRRITATION AT CONCENTRATIONS BELOW 1 MG/M3. CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE. OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

COBALT:

ACUTE EXPOSURE- VOMITING, DIARRHEA, AND A SENSATION OF HOTNESS MAY OCCUR AFTER THE INGESTION OF LARGE AMOUNTS. CHRONIC EXPOSURE- CARDIOMYOPATHY HAS BEEN CAUSED BY EXCESSIVE INTAKE OF COBALT. SIGNS AND SYMPTOMS OF THIS ILLNESS INCLUDED GASTROINTESTINAL DISTURBANCES WITH NAUSEA, VOMITING AND DIARRHEA, SHORTNESS OF BREATH, DRY AND PERSISTENT COUGH, THORACIC AND RIGHT UPPER QUADRANT ABDOMINAL PAIN, ANKLE EDEMA, CYANOSIS, LOWERED BLOOD PRESSURE, HEART ENLARGEMENT, PERICARDIAL EFFUSION, RAPID HEART RATE, ELECTROCARDIOGRAPHIC ABNORMALITIES AND DEATH. SEQUELA FOLLOWING THIS ILLNESS INCLUDED RECURRENT CHRONIC HEART FAILURE, AND NEUROLOGIC AND MENTAL DETERIORATION. THERAPEUTIC ADMINISTRATION HAS CAUSED NAUSEA, VOMITING, SKIN RASH, TINNITUS, NERVE DEAFNESS, THYROID HYPERPLASIA, MYXEDEMA, POLYCYTHEMIA, CONGESTIVE HEART FAILURE, AND DEATH. ADMINISTRATION TO HUMANS AT 1 MG DAILY FOR THREE DAYS RESULTED IN PROLONGED TIME FOR BLOOD CLOT FORMATION. DEGENERATIVE CHANGES HAVE OCCURRED IN THE LIVER, KIDNEYS, AND PANCREAS OF ANIMALS. ADMINISTRATION IN DRINKING WATER PRODUCED ERYTHROPOIETIC EFFECTS, IMMUNOSUPPRESSION, AND INHIBITED REFLEX LEARNING IN RATS.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:

THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

POISONING FROM COBALT COMPOUNDS:

GIVE CALCIUM DISODIUM EDETATE, AVAILABLE AS 5 ML AMPULES OF A 20% SOLUTION. GIVE 15-25 MG/KG (0.08-0.125 ML OF 20% SOLUTION PER KILOGRAM OF BODY WEIGHT) IN 250-500 ML OF 5% DEXTROSE INTRAVENOUSLY OVER A 1 TO 2 HOUR PERIOD, TWICE DAILY. THE MAXIMUM DOSE SHOULD NOT EXCEED 50 MG/KG/DAY. THE DRUG SHOULD BE GIVEN IN 5-DAY COURSES WITH A REST PERIOD OF AT LEAST 2 DAYS BETWEEN COURSES. AFTER THE FIRST COURSE, SUBSEQUENT COURSES SHOULD NOT EXCEED 50 MG/KG/DAY. DAILY URINALYSES SHOULD BE DONE DURING THE TREATMENT PERIOD. THE DOSAGE SHOULD BE REDUCED IF ANY UNUSUAL URINARY FINDINGS APPEAR. FOR INTRAMUSCULAR ADMINISTRATION, GIVE 20% SOLUTION (200 MG/ML), 12.5 MG/KG BODY WEIGHT EVERY 4-6 HOURS. DILUTE EACH DOSE WITH AN EQUAL VOLUME OF 1%

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PROCAINE. DOSE LIMITATION IS THE SAME AS THAT GIVEN ABOVE. FOR SEVERE INTOXICATIONS, SOME EXPERTS URGE SIMULTANEOUS ADMINISTRATION OF DIMERCAPROL DURING THE FIRST 48 HOURS OF TREATMENT (DREISBACH HANDBOOK OF POISONING, 12TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

REACTIVITY

REACTIVITY:

STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

FINELY DIVIDED COBALT MAY REACT PYROPHORICALLY IN AIR.

INCOMPATIBILITIES:

COBALT:

ACETYLENE: INCANDESCENT REACTION.
AMMONIUM NITRATE: VIOLENT OR EXPLOSIVE REACTION.
BROMINE PENTAFLUORIDE: VIOLENT REACTION WITH POSSIBLE IGNITION.
BROMINE TETRAFLUORIDE: VIOLENT REACTION WITH POSSIBLE IGNITION.
HYDRAZINIUM NITRATE: POSSIBLE EXPLOSION ABOVE 70 C.
NITRYL FLUORIDE: INCANDESCENT REACTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
1,3,4,7-TETRAMETHYLISOINDOLE: POSSIBLE EXPLOSION ON HEATING.

DECOMPOSITION:

THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF COBALT.

POLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

AVOID CONTACT WITH HEAT, SPARKS, FLAMES OR OTHER SOURCES OF IGNITION. MATERIAL IS EXTREMELY FLAMMABLE AND MAY BURN RAPIDLY WITH FLARE-BURNING EFFECT.

SPILL AND LEAK PROCEDURES

WATER SPILL:

THE CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) PROHIBITS CONTAMINATING ANY KNOWN SOURCE OF DRINKING WATER WITH SUBSTANCES KNOWN TO CAUSE CANCER AND/OR REPRODUCTIVE TOXICITY.

OCCUPATIONAL SPILL:

SHUT OFF IGNITION SOURCES. DO NOT TOUCH SPILLED MATERIAL. FOR SMALL SPILLS, WITH CLEAN SHOVEL, PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, WET DOWN WITH WATER AND DIKE FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

PROTECTIVE EQUIPMENT

VENTILATION:

PROVIDE LOCAL EXHAUST VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS, NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z. THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE. MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

0.5 MG(CO)/M3- DUST MASK, EXCEPT SINGLE-USE RESPIRATOR.

1 MG(CO)/M3- DUST MASK, EXCEPT SINGLE-USE AND QUARTER-MASK RESPIRATORS. FUME OR HIGH-EFFICIENCY PARTICULATE RESPIRATOR.

5 MG(CO)/M3- HIGH-EFFICIENCY PARTICULATE RESPIRATOR WITH A FULL FACEPIECE

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SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE, HELMET OR HOOD.
SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

20 MG(CO)/M3- POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY FILTER
WITH A FULL FACEPIECE.
TYPE 'C' SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED
IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.

ESCAPE- HIGH-EFFICIENCY PARTICULATE RESPIRATOR WITH A FULL FACEPIECE.
SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

ANY SELF-CONTAINED BREATHING APPARATUS THAT HAS A FULL FACEPIECE AND IS
OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.

ANY SUPPLIED-AIR RESPIRATOR THAT HAS A FULL FACEPIECE AND IS OPERATED IN A
PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE IN COMBINATION WITH AN
AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND
OR OTHER POSITIVE-PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT
TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS
SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A
FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE
EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN
AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 11/30/84 REVISION DATE: 07/14/93

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MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION

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MSDS # N 162

COPPER (SCRAP - GENERIC)

Issued: December 1985

Revised:

From Genium's MSDS Collection, to be used as a reference.

111846

SECTION 1. MATERIAL IDENTIFICATION

18

MATERIAL NAME: COPPER (SCRAP-GENERIC)

OTHER DESIGNATIONS: Copper (Cu) Metal, Casting, or Powder Scrap

DESCRIPTION: Copper or Copper Alloy.

MANUFACTURER: Available from several suppliers.



SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

BASE METAL: Copper (Cu) CAS #7440 50 8

100%
maximum

*PEL (OSHA): 0.1 mg/m³
**TLV (ACGIH): 0.2 mg/m³
(as copper fume)

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CREVE COEUR

*PEL (ACGIH): 1.0 mg/m³
**TLV (ACGIH): 1.0 mg/m³
(as copper dust or
mist)
Rat, oral TDLo:
152 mg/kg
Human, oral TDLo:
120 mg/kg

* OSHA Permissible Exposure Limit (PEL)

** American Conference of Governmental Industrial Hygienists (ACGIH)
Threshold Limit Values (TLV's) current as of revision date.

SECTION 3. PHYSICAL DATA

Boiling Point @ 1 atm ~2500°C

Melting Point Approx. 1100°C

Vapor Pressure @ 20°C (mm Hg) ... N/A

Solubility in Water Insoluble

% Volatile by Volume N/A

Evaporation Rate (BuAc=1) ... N/A

APPEARANCE & ODOR: Solid, various shapes, odorless, red/brown-colored metal or powder.

SECTION 4. FIRE AND EXPLOSION DATA

Lower

Upper

Flash Point and Method

Autoignition Temp.

Flammability Limits in Air

None

None

None

NA

NA

EXTINGUISHING MEDIA: will not burn. Use water to cool.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Fine metal particles produced when ground, sawed, etc., can burn. High concentration of fines (fine particles) in the air may present an explosion hazard. Good housekeeping and adequate ventilation is recommended. Use air-supplied or self-contained breathing apparatus if fires are in enclosed areas.

SECTION 5. REACTIVITY DATA

This material is stable under most conditions. No hazardous polymerization or explosion conditions exist for the bulk metal.

INCOMPATIBILITIES: Strong acids

DECOMPOSITION PRODUCTS: Metallic oxides (copper fumes)

111846

SECTION 6. HEALTH HAZARD INFORMATION		TLV See Section 2
<p>Copper scrap is poorly absorbed through the skin or alimentary tract, and while in the solid state it is not considered a hazard. Operations such as welding, dust generation, or fume generation could allow exposure to copper dusts and fumes. Therefore, it is important to maintain exposure levels below the regulated levels as noted in Section 2. Determine actual exposures by industrial hygiene monitoring.</p> <p>Short-term exposure to copper dusts or fumes may cause irritation of the upper respiratory tract and "metal fume fever," a transient condition with symptoms of fever and chills. Chronic or long-term exposure may result in lung X-ray changes not associated with harmful effects.</p> <p>FIRST AID:</p> <p>EYE CONTACT: Protect eyes from particles or fumes. Wash exposed eyes with copious amounts of water for at least 15 minutes.</p> <p>SKIN CONTACT: Protect skin from molten metal and radiant heat when melting scrap. Skin contamination from powder may be cleaned with soap and water. Machine turnings may present a laceration hazard.</p> <p>INHALATION: Move to fresh air, restore or support breathing as required.</p> <p>INGESTION: NA</p> <p>Copper has not been identified as a carcinogen by NTP, IARC or OSHA.</p>		
SECTION 7. SPILL, LEAK AND DISPOSAL PROCEDURES		
<p>Copper scrap is normally recycled or sold as scrap or landfilled if recycling cannot be justified. Clean up dust/powder spills promptly by vacuum and wet cleaning methods. Treat as an inert solid. Dispose of in accordance with OSHA, EPA, state, or local regulations.</p>		
SECTION 8. SPECIAL PROTECTION INFORMATION		
<p>RESPIRATORY PROTECTION: Use NIOSH/MSHA-approved dust/fume respirator or air-supplied respirator if concentrations of copper in air exceed the regulated standards. Use air-supplied or self-contained breathing apparatus (SCBA) in confined spaces.</p> <p>VENTILATION: Use only with adequate ventilation where respirable dusts/mists/fumes are possible. Use local exhaust ventilation when cutting, grinding, welding, or remelting.</p> <p>EYE PROTECTION AND PROTECTIVE CLOTHING: Protect skin from cuts and from hot procedures and processes. Eye and face protection required when grinding, welding, cutting or remelting. Maintain good hygiene and safe work processes. Scrap from machining may be contaminated with cutting oils. When handling oil-contaminated copper, wear rubber gloves to prevent skin contact.</p> <p>Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.</p>		
SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS		
<p>Always maintain exposures below the PEL/TLV. Use industrial hygiene air monitoring to ensure that your use of this material does not create a hazard. Always use exhaust ventilation when feasible.</p>		
DATA SOURCE(S) CODE (See Glossary) 1-12, 14, 19, 20, 30, 31, 40, 59, OW		
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	INDUST. HYGIENE/SAFETY <i>DLW 3-86</i>	
	MEDICAL REVIEW: <i>[Signature] Mar 86</i>	



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DATE: 04/02/93
CUST#: 326135
PO#: V341283

M A T E R I A L S A F E T Y D A T A S H E E T P A G E 1

- - - - IDENTIFICATION - - - -

PRODUCT #: 32645-3
CAS #: 7440-50-8 NAME: COPPER, POWDER, SPHEROIDAL, 5 TO 10
MF: CU MICRON, 99%

SYNONYMS

ALLBRI NATURAL COPPER * ANAC 110 * ARWOOD COPPER * BRONZE POWDER *
CDA 101 * CDA 102 * CDA 110 * CDA 122 * C.I. 77400 * C.I. PIGMENT
METAL 2 * COPPER (ACGIH, OSHA) * COPPER-AIRBORNE * COPPER BRONZE *
COPPER-MILLED * COPPER SLAG-AIRBORNE * COPPER SLAG-MILLED * 1721 GOLD
* GOLD BRONZE * KAFAR COPPER * M 1 * M 3 * M 4 * M1 (COPPER) * M2
(COPPER) * M3 (COPPER) * M4 (COPPER) * M3R * M3S * OFHC CU * RANEY
COPPER *

- - - - TOXICITY HAZARDS - - - -

RTECS #: GL5325000
COPPER

TOXICITY DATA

IPR-MUS LD50: 3500 UG/KG 38MKAJ 2A, 1623, 81

REVIEWS, STANDARDS, AND REGULATIONS

ACGIH TLV-TWA 1 MG(CU)/M3 (DUST AND MISTS) 85INA8 5,146,86
ACGIH TLV-TWA 0.2 MG/M3 (FUME) 85INA8 5,146,86
EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
FEREAC 54,4388,89
MSHA STANDARD-AIR: TWA 0.1 MG/M3 (FUME, DUSTS & MISTS) DTLVS* 3,59,71
OSHA PEL: 8H TWA 0.1 MG(CU)/M3, FUME FEREAC 54,2923,89
OSHA PEL: 8H TWA 1 MG(CU)/M3, DUSTS AND MISTS FEREAC 54,2923,89
OSHA PEL FINAL: 8H TWA 0.1 MG(CU)/M3, FUME FEREAC 54,2923,89
OSHA PEL FINAL: 8H TWA 1 MG(CU)/M3, DUSTS AND MISTS FEREAC 54,2923,89
OEL-ARAB REPUBLIC OF EGYPT: TWA 0.1 MG/M3 JANUARY 1993 (FUME)
OEL-AUSTRALIA: TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-AUSTRALIA: TWA 1 MG/M3 JANUARY 1993 (DUST)
OEL-BELGIUM: TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-BELGIUM: TWA 1 MG/M3 JANUARY 1993 (DUST)
OEL-DENMARK: TWA 0.1 MG/M3 JANUARY 1993 (FUME)
OEL-DENMARK: TWA 1 MG/M3 JANUARY 1993 (DUST)
OEL-FINLAND: TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-FINLAND: TWA 1 MG/M3 JANUARY 1993
OEL-FINLAND: TWA 1 MG/M3 JANUARY 1993 (DUST)
OEL-FRANCE: TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-FRANCE: TWA 1 MG/M3; STEL 2 MG/M3 JANUARY 1993 (DUST)

CONTINUED ON NEXT PAGE

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PAGE 2

CUST#: 326135
PO#: V341283

PRODUCT #:

NAME: COPPER, POWDER, SPHEROIDAL, 5 TO 10
MICRON, 99%

MF: CU

- - - - TOXICITY HAZARDS - - - -

OEL-GERMANY:TWA 0.1 MG/M3 JANUARY 1993 (FUME)
OEL-GERMANY:TWA 1 MG/M3 JANUARY 1993
OEL-GERMANY:TWA 1 MG/M3 JANUARY 1993 (DUST)
OEL-HUNGARY:TWA 0.2 MG/M3;STEL 0.4 MG/M3 JANUARY 1993 (DUST)
OEL-INDIA:TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-POLAND:TWA 0.1 MG/M3 JANUARY 1993 (FUME)
OEL-RUSSIA:STEL 0.5 PPM (1 MG/M3) JANUARY 1993 (DUST)
OEL-SWEDEN:TWA 0.2 MG/M3 JANUARY 1993 (RESPIRABLE DUST)
OEL-SWEDEN:TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-SWEDEN:TWA 1 MG/M3 JANUARY 1993 (TOTAL DUST)
OEL-SWITZERLAND:TWA 0.1 MG/M3;STEL 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-SWITZERLAND:TWA 1 MG/M3;STEL 1 MG/M3 JANUARY 1993
OEL-THAILAND:TWA 0.1 MG/M3 JANUARY 1993 (FUME)
OEL-THAILAND:TWA 1 MG/M3 JANUARY 1993
OEL-THE NETHERLANDS:TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-THE NETHERLANDS:TWA 1 MG/M3 JANUARY 1993 (DUST)
OEL-THE PHILLIPPINES:TWA 1.0 MG/M3 JANUARY 1993 (FUME)
OEL-UNITED KINGDOM:TWA 0.2 MG/M3 JANUARY 1993 (FUME)
OEL-UNITED KINGDOM:TWA 1 MG/M3 JANUARY 1993
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA, NEW ZEALAND, SINGAPORE,
VIETNAM CHECK ACGIH TLV
NIOSH REL TO COPPER, DUSTS AND MISTS-AIR:10H TWA 1 MG/M3 NIOSH* DHHS
#92-100,92
NIOSH REL TO COPPER, FUME-AIR:10H TWA 0.1 MG/M3 NIOSH* DHHS #92-100,92
NOHS 1974: HZD M2276; NIS 27; TNF 1213; NOS 35; TNE 24737
NOES 1983: HZD X5915; NIS 5; TNF 162; NOS 5; TNE 11889; TFE 421
EPA TSCA CHEMICAL INVENTORY, JUNE 1990
EPA TSCA SECTION 8(E) STATUS REPORT 8EHQ-0680-0345
EPA TSCA SECTION 8(E) STATUS REPORT 8EHQ-0586-0601
ON EPA IRIS DATABASE
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JANUARY 1993
NIOSH ANALYTICAL METHODS: SEE COPPER, 7029; WELDING AND BRAZING FUME,
7200; ELEMENTS, 7300
NIOSH ANALYTICAL METHODS: SEE COPPER (DUST AND FUME) 7029
NIOSH ANALYTICAL METHODS: SEE WELDING AND BRAZING FUME 7200
NIOSH ANALYTICAL METHODS: SEE ELEMENTS IN BLOOD OR TISSUE 8005
NIOSH ANALYTICAL METHODS: SEE METALS IN URINE (ICP) 8310
OSHA ANALYTICAL METHOD #ID-1256

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PAGE 3

CUST#: 326135
PO#: V341283

PRODUCT #:

MF: CU

NAME: COPPER, POWDER, SPHEROIDAL, 5 TO 10
MICRON, 99%

- - - - TOXICITY HAZARDS - - - -

TARGET ORGAN DATA

LUNGS, THORAX OR RESPIRATION (FIBROSIS, FOCAL)
LUNGS, THORAX OR RESPIRATION (TUMORS)
GASTROINTESTINAL (NAUSEA OR VOMITING)
MATERNAL EFFECTS (UTERUS, CERVIX, VAGINA)
EFFECTS ON FERTILITY (FEMALE FERTILITY INDEX)
EFFECTS ON FERTILITY (PRE-IMPLANTATION MORTALITY)
EFFECTS ON FERTILITY (POST-IMPLANTATION MORTALITY)
EFFECTS ON EMBRYO OR FETUS (FETOTOXICITY)
SPECIFIC DEVELOPMENTAL ABNORMALITIES (CENTRAL NERVOUS SYSTEM)
SPECIFIC DEVELOPMENTAL ABNORMALITIES (MUSCULOSKELETAL SYSTEM)
TUMORIGENIC (EQUIVOCAL TUMORIGENIC AGENT BY RTECS CRITERIA)
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES
(RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR
COMPLETE INFORMATION.

- - - - HEALTH HAZARD DATA - - - -

ACUTE EFFECTS

MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.
CAUSES EYE AND SKIN IRRITATION.
MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER
RESPIRATORY TRACT.
EXPOSURE CAN CAUSE:
DAMAGE TO THE LUNGS
STOMACH PAINS, VOMITING, DIARRHEA.
BLOOD EFFECTS

FIRST AID

CONTAMINATION OF THE EYES SHOULD BE TREATED BY IMMEDIATE AND PROLONGED
IRRIGATION WITH COPIOUS AMOUNTS OF WATER.
IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS
AMOUNTS OF WATER.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL
RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.
CALL A PHYSICIAN.
REMOVE AND WASH CONTAMINATED CLOTHING PROMPTLY.

ADDITIONAL INFORMATION

CONTINUED ON NEXT PAGE

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M A T E R I A L S A F E T Y D A T A S H E E T

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CUST#: 326135
PO#: V341283

PRODUCT #:

MF: CU

NAME: COPPER, POWDER, SPHEROIDAL, 5 TO 10
MICRON, 99%

- - - - HEALTH HAZARD DATA - - - -

CHRONIC COPPER POISONING IS TYPIFIED BY HEPATIC CIRRHOSIS, BRAIN DAMAGE AND DEMYELINATION, KIDNEY DEFECTS, AND COPPER DEPOSITION IN THE CORNEA AS EXEMPLIFIED BY HUMANS WITH WILSON'S DISEASE. IT HAS ALSO BEEN REPORTED THAT COPPER POISONING HAS LEAD TO HEMOLYTIC ANEMIA AND ACCELERATES ARTERIOSCLEROSIS.

- - - - PHYSICAL DATA - - - -

SPECIFIC GRAVITY: 8.940

APPEARANCE AND ODOR
DULL RED POWDER

- - - - FIRE AND EXPLOSION HAZARD DATA - - - -

EXTINGUISHING MEDIA
DRY CHEMICAL POWDER.
DO NOT USE WATER.

SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
FLAMMABLE SOLID.

UNUSUAL FIRE AND EXPLOSIONS HAZARDS
THIS MATERIAL, LIKE MOST MATERIALS IN POWDER FORM, IS CAPABLE OF CREATING A DUST EXPLOSION.
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

- - - - REACTIVITY DATA - - - -

INCOMPATIBILITIES
STRONG ACIDS
STRONG OXIDIZING AGENTS
ACID CHLORIDES
HALOGENS
MAY DISCOLOR ON EXPOSURE TO AIR AND MOISTURE.

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M A T E R I A L S A F E T Y D A T A S H E E T

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CUST#: 326135
PO#: V341283

PRODUCT #:

MF: CU

NAME: COPPER, POWDER, SPHEROIDAL, 5 TO 10
MICRON, 99%

- - - - REACTIVITY DATA - - - -

VIOLENT REACTION MAY OCCUR WITH ACETYLENE, AMMONIUM NITRATE, BROMATES, CHLORATES, IODATES, CHLORINE, CHLORINE TRIFLUORIDE, ETHYLENE OXIDE, FLUORINE, HYDROGEN PEROXIDE, HYDRAZINE MONONITRITE, HYDROGEN SULFIDE, HYDRAZOIC ACID, LEAD AZIDE, POTASSIUM PEROXIDE, SODIUM AZIDE, AND SODIUM PEROXIDE. REACTION OF COPPER WOOL, TRICHLOROACETIC ACID IN DIMETHYL SULFOXIDE IS VERY EXOTHERMIC.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
NATURE OF DECOMPOSITION PRODUCTS NOT KNOWN.

- - - - SPILL OR LEAK PROCEDURES - - - -

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

EVACUATE AREA.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL.
USE NONSPARKING TOOLS.
AVOID RAISING DUST.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

WASTE DISPOSAL METHOD

MATERIAL IN THE ELEMENTAL STATE SHOULD BE RECOVERED FOR REUSE OR RECYCLING.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

- - - - PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE - - - -

CHEMICAL SAFETY GOGGLES.
COMPATIBLE CHEMICAL-RESISTANT GLOVES.
SAFETY SHOWER AND EYE BATH.
NIOSH/MSHA-APPROVED RESPIRATOR.
MECHANICAL EXHAUST REQUIRED.
DO NOT BREATHE DUST.
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
IRRITANT.
KEEP TIGHTLY CLOSED.
AIR SENSITIVE
KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME.
STORE UNDER NITROGEN.

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M A T E R I A L S A F E T Y D A T A S H E E T

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CUST#: 326135
PO#: V341283

PRODUCT #:

MF: CU

NAME: COPPER, POWDER, SPHEROIDAL, 5 TO 10
MICRON, 99%

- - - - PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE - - - -

LABEL PRECAUTIONARY STATEMENTS

FLAMMABLE (USA DEFINITION)

HIGHLY FLAMMABLE (EUROPEAN DEFINITION)

IRRITANT

IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.

AIR SENSITIVE

STORE UNDER NITROGEN.

KEEP AWAY FROM SOURCES OF IGNITION. NO SMOKING.

TAKE PRECAUTIONARY MEASURES AGAINST STATIC DISCHARGES.

IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF

WATER AND SEEK MEDICAL ADVICE.

WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE

PROTECTION.

REGULATORY INFORMATION

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.

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LEAD
LEAD
LEAD

MATERIAL SAFETY DATA SHEET

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SUBSTANCE IDENTIFICATION

SUBSTANCE: **LEAD** CAS NUMBER 7439-92-1

TRADE NAMES/SYNONYMS
C1 PIGMENT METAL 4, C1 77575, LEAD FLAKE, KS 4, LEAD S 2, SI, SO,
PLUMBUM, SO, PB-S 100, LEAD ELEMENT, L18, L24, L29, L27, T134, L246, PB,
ACC12510

CHEMICAL FAMILY:
Metal

MOLECULAR FORMULA: PB

MOLECULAR WEIGHT: 207.19

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=U FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: LEAD PERCENT 99.8
CAS# 7439-92-1

OTHER CONTAMINANTS: BISMUTH, COPPER, ARSENIC, ANTIMONY, TIN, IRON,
SILVER, ZINC

EXPOSURE LIMITS:

LEAD, INORGANIC FUMES AND DUST (AS PB):

50 ug/m3 OSHA 8 hour TWA

30 ug/m3 OSHA 8 hour TWA action level

If an employee is exposed to lead for more than 8 hours per day the following formula is used:

Maximum permissible limit (in ug/m3) = 400 divided by hours worked in the day

0.15 mg/m3 ACGIH TWA

(Notice of Intended Changes 1993-94)

0.10 mg/m3 NIOSH recommended 10 hour TWA

0.1 mg/m3 DFG MAK TWA,

1.0 mg/m3 DFG MAK 30 minute peak, average value, 1 time/shift

MEASUREMENT METHOD: Particulate filter, nitric acid/hydrogen peroxide,
atomic absorption spectrometry; (NIOSH Vol. III # 7082)

1 pound CERCLA Section 103 Reportable Quantity

Subject to SARA Section 313 Annual Toxic Chemical Release Reporting

Subject to California Proposition 65 cancer and/or reproductive toxicity
warning and release requirements- (February 27, 1987)

PHYSICAL DATA

DESCRIPTION: Bluish-white, silvery gray, heavy, malleable metal

BOILING POINT: 3164 F (1740 C) MELTING POINT: 622 F (328 C)

SPECIFIC GRAVITY: 11.3 VAPOR PRESSURE: 1.3 mmHg @ 970 C

SOLUBILITY IN WATER: Insoluble

SOLVENT SOLUBILITY: Soluble in nitric acid, hot concentrated sulfuric acid

HARDNESS (MOHS): 1.5

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:

Negligible fire hazard in bulk form; however, dust, powder, or fumes are

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Flammable or explosive when exposed to heat or flames

FIREFIGHTING MEDIA:

Dry chemical, carbon dioxide, water spray or regular foam
(1990 Emergency Response Guidebook, DOT P 5800.5).

For larger fires, use water spray, fog or regular foam
(1990 Emergency Response Guidebook, DOT P 5800.5).

FIREFIGHTING:

Move container from fire area if you can do it without risk (1990 Emergency
Response Guidebook, DOT P 5800.5, Guide Page 53).

Extinguish using agent suitable for type of surrounding fire. Avoid breathing
vapors and dusts. Keep upwind.

TOXICITY

LEAD:

TOXICITY DATA: 10 ug/m3 inhalation-human TLo, 450 mg/kg/6 years
oral-woman TLo, 1000 mg/kg intraperitoneal-rat LDLo, mutagenic data
(RTECS); reproductive effects data (RTECS).

CARCINOGEN STATUS: Human Inadequate Evidence, Animal Sufficient Evidence
(IARC Group-2B for inorganic lead compounds). Renal tumors were produced in
animals by lead acetate, subacetate and phosphate given orally,
subcutaneously or intraperitoneally. No evaluation could be made of the
carcinogenicity of powdered lead.

ACUTE TOXICITY LEVEL: Insufficient data.

TARGET EFFECTS: Neurotoxin; nephrotoxin; teratogen. Poisoning may also affect
the blood, heart, and the endocrine and immune systems.

AT INCREASED RISK FROM EXPOSURE: Persons with nervous system or
gastrointestinal disorders, anemia, or chronic bronchitis.

ADDITIONAL DATA: May cross the placenta. Smoking may result in high blood lead
levels.

HEALTH EFFECTS AND FIRST AID

INHALATION:

LEAD:

See information on lead compounds and metal fume fever.

LEAD COMPOUNDS:

NEUROTOXIN/NEPHROTOXIN/TERATOGEN.

ACUTE EXPOSURE- Absorption of large amounts of lead may cause a metallic
taste, thirst, a burning sensation in the mouth and throat, salivation,
abdominal pain with severe colic, vomiting, diarrhea of black or bloody
stools, constipation, fatigue, sleep disturbances, dullness, restlessness,
irritability, memory loss, loss of concentration, delirium, oliguria often
with hematuria and albuminuria, encephalopathy with visual failure,
paresthesias, muscle pain and weakness, convulsions, and paralysis. Death
may result from cardiorespiratory arrest or shock. Survivors of acute
exposure may experience the onset of chronic intoxication. Liver effects
may include enlargement and tenderness, and jaundice. The fatal dose of
absorbed lead is approximately 0.5 grams. Pathological findings include
gastrointestinal inflammation and renal tubular degeneration.

CHRONIC EXPOSURE- Prolonged or repeated exposure to low levels of lead may
result in an accumulation in body tissues and exert adverse effects on the
blood, nervous systems, heart, endocrine and immune systems, kidneys, and
reproduction. Early stages of lead poisoning, "plumbism", may be evidenced
by anorexia, weight loss, constipation, apathy or irritability, occasional
vomiting, fatigue, headache, weakness, metallic taste in the mouth,
gingival lead line in persons with poor dental hygiene, and anemia. Loss
of recently developed motor skills is generally observed only in children.
More advanced stages of poisoning may be characterized by intermittent
vomiting, irritability and nervousness, myalgia of the arms, legs, joints
and abdomen, paralysis of the extensor muscles of the arms and legs with
wrist and/or foot drop. Severe "plumbism" may result in persistent
vomiting, ataxia, periods of stupor or lethargy, encephalopathy with
visual disturbances which may progress to optic neuritis and atrophy,
hypertension, papilledema, cranial nerve paralysis, delirium, convulsions,
and coma. Neurologic sequelae may include mental retardation, seizures,
cerebral palsy, and dystonia musculorum deformans. Irreversible kidney
damage has been associated with industrial exposure. Reproductive effects
have been exhibited in both males and females. Paternal effects may
include decreased sex drive, impotence, sterility and adverse effects on
the sperm which may increase the risk of birth defects. Maternal effects
may include miscarriage and stillbirths in exposed women or women whose
husbands were exposed, abortion, sterility or decreased fertility, and
abnormal menstrual cycles. Lead crosses the placenta and may affect the
fetus causing birth defects, mental retardation, behavioral disorders,
and death during the first year of childhood. Animal studies indicate that
reproductive effects may be additive if both parents are exposed to lead.

METAL FUME FEVER:

ACUTE EXPOSURE- Metal fume fever, an influenza-like illness, may occur
due to the inhalation of freshly formed metal oxide particles sized

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below 1.5 microns and usually between 0.02-0.05 microns. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur. Tolerance to fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours.

CHRONIC EXPOSURE: There is no form of chronic metal fume fever, however, repeated bouts with symptoms as described above are quite common. Resistance to the condition develops after a few days of exposure, but is quickly lost in 1 or 2 days.

FIRST AID: Remove from exposure area to fresh air immediately. If breathing has stopped, perform artificial respiration. Keep person warm and at rest. Treat symptomatically and supportively. Get medical attention immediately.

SKIN CONTACT:

LEAD:
See information on lead compounds.

LEAD COMPOUNDS:

ACUTE EXPOSURE: Contact with lead powders or dust may be irritating. Lead is not absorbed through the skin, but may be transferred to the mouth inadvertently by cigarettes, chewing tobacco, food, or make up.

CHRONIC EXPOSURE: Prolonged or repeated exposure to the powder or dust may result in dermatitis. Systemic toxicity may develop if lead is transferred to the mouth by cigarettes, chewing tobacco, food, or make up.

FIRST AID: Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

EYE CONTACT:

LEAD:
See information on lead compounds.

LEAD COMPOUNDS:

ACUTE EXPOSURE: Lead dust or powders may be irritating. Metallic lead particles may cause an inflammatory foreign body reaction and injury is generally thought to be mechanical and not toxic.

CHRONIC EXPOSURE: Prolonged exposure may cause conjunctivitis.

FIRST AID: Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

INGESTION:

LEAD:
See information on lead compounds.

LEAD COMPOUNDS:

NEUROTOXIN/NEPHROTOXIN/TERATOGEN

ACUTE EXPOSURE: Absorption of large amounts of lead from the intestinal tract may cause all the same effects as detailed in acute inhalation. The fatal dose of absorbed lead is approximately 0.5 grams.

CHRONIC EXPOSURE: Prolonged or repeated exposure to low levels of lead may result in an accumulation in body tissues and adverse effects on the kidneys, heart and blood and on the nervous, reproductive, endocrine and immune systems as detailed in chronic inhalation.

FIRST AID: Do not induce vomiting. Qualified medical personnel should remove chemical by gastric lavage or catharsis. Activated charcoal is useful. Get medical attention immediately.

ANTIDOTE:

The following antidote has been recommended. However, the decision as to whether the severity of poisoning requires administration of any antidote and actual dose required should be made by qualified medical personnel.

FOR LEAD POISONING:

Initiate urine flow first. Give 10% dextrose in water intravenously, 10-20 mL/kg body weight, over a period of 1-2 hours. If urine flow does not start, give mannitol, 20% solution, 5-10 mL/kg body weight intravenously over 20 minutes. Fluid must be limited to requirements and catheterization may be necessary in coma. Daily urine output should be 350-500 mL/m²/24 hours. Excessive fluids further increase cerebral edema.

For adults with acute encephalopathy, give dimercaprol, 4 mg/kg, intramuscularly every 4 hours for 30 doses. Beginning 4 hours later, give calcium disodium edetate at a separate injection site, 12.5 mg/kg intramuscularly every 4 hours as a 20% solution, with 0.5% procaine added, for a total of 30 doses. If significant improvement has not occurred by the fourth day, increase the number of injections by 10 for each drug.

For symptomatic adults, the course of dimercaprol and calcium disodium edetate can be shortened or calcium disodium edetate only can be given in a dosage of 50 mg/kg intravenously as 0.5% solution in 5% dextrose in water or normal saline by infusion over not less than 8 hours for not more than

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5 days. Follow with penicillamine, 500-750 mg/day, orally for 1-2 months or until urine lead levels drops below 0.3 mg/24 hours (Dreisbach, Handbook of Poisoning, 12th Ed.). Antidote should be administered by qualified medical personnel.

REACTIVITY

REACTIVITY:

Stable under normal temperatures and pressures.

INCOMPATIBILITIES:

LEAD:

AMMONIUM NITRATE: Violent or explosive reaction.

CHLORINE TRIFLUORIDE: Violent reaction.

DISODIUM ACETYLIDE: Trituration in mortar may be violent and liberate carbon.

HYDROGEN PEROXIDE (52% OR GREATER): Violent decomposition.

HYDROGEN PEROXIDE (60% SOLUTION) AND TRIOXANE: Spontaneously detonable.

METALS (ACTIVE): Incompatible.

NITRIC ACID: Lead-containing rubber may ignite.

OXIDIZERS (STRONG): Incompatible.

SODIUM AZIDE: Forms lead azide and copper azide in copper pipe.

SODIUM CARBIDE: Vigorous reaction.

SULFURIC ACID (HOT): Reacts.

ZIRCONIUM-LEAD ALLOYS: Ignition on impact.

DECOMPOSITION:

Thermal decomposition products are toxic oxides of lead.

POLYMERIZATION:

Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

STORAGE AND DISPOSAL

Observe all federal, state and local regulations when storing or disposing of this substance.

Storage

Store away from incompatible substances.

Disposal

Lead - Regulatory level: 5.0 mg/l (TCLP-40 CFR 261 Appendix II) materials which contain the above substance at or above the TCLP regulatory level meet the EPA toxicity characteristic, and must be disposed of in accordance with 40 CFR part 262. EPA Hazardous Waste Number D008.

CONDITIONS TO AVOID

May burn but does not ignite readily. Prevent dispersion of dust in air. Do not allow spilled material to contaminate water sources.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:

Do not touch spilled material. Stop leak if you can do it without risk. For small spills, take up with sand or other absorbent material and place into containers for later disposal. For small dry spills, with a clean shovel place material into clean, dry container and cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry.

Residue should be cleaned up using a high-efficiency particulate filter vacuum.

Reportable Quantity (RQ): 1 pound.

The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity for this substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:

Provide local exhaust ventilation system to meet published exposure limits.

Lead (elemental, inorganic, and soaps):

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Ventilation should meet the requirements in 29 CFR 1910.1025(e).

RESPIRATOR:

The following respirators are the minimum legal requirements as set forth by the Occupational Safety and Health Administration found in 29 CFR 1910, Subpart Z.

RESPIRATORY PROTECTION FOR LEAD AEROSOLS

Airborne concentration of lead or condition of use	Required respirator
Not in excess of 0.5 mg/m ³ (10x PEL)	Half-mask, air purifying respirator equipped with high-efficiency filters
Not in excess of 2.5 mg/m ³ (50x PEL)	Full facepiece, air-purifying respirator with high efficiency filters
Not in excess of 50 mg/m ³ (1000x PEL)	Any powered air purifying respirator with high efficiency filters, or Half-mask supplied-air respirator operated in positive pressure mode
Not in excess of 100 mg/m ³	Supplied-air respirators with full facepiece, hood or helmet or suit, operated in positive pressure mode
Greater than 100 mg/m ³ , unknown concentrations or firefighting	Full facepiece, self-contained breathing apparatus operated in positive pressure mode.

(Respirators specified for higher concentrations can be used at lower concentrations of lead).
 (Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.)
 (A high efficiency particulate filter means 99.97% efficient against 0.3 micron particles.)

The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH pocket guide to chemical hazards or NIOSH criteria documents.
 The specific respirator selected must be based on contamination levels found in the work place and be jointly approved by the National Institute of Occupational Safety and Health and the Mine Safety and Health Administration.

LEAD, INORGANIC FUMES AND DUSTS (AS PB):

0.50 mg(Pb)/m ³	- Any supplied-air respirator Any air-purifying respirator with a high-efficiency particulate filter. Any self-contained breathing apparatus.
1.25 mg(Pb)/m ³	- Any powered air-purifying respirator with a high-efficiency particulate filter Any supplied-air respirator operated in a continuous flow mode.
2.50 mg(Pb)/m ³	- Any air-purifying full facepiece respirator with a high-efficiency particulate filter Any powered air-purifying respirator with a tight-fitting facepiece and a high efficiency particulate filter. Any self-contained breathing apparatus with a full facepiece Any supplied-air respirator with a full facepiece Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode.
50.0 mg(Pb)/m ³	- Any supplied-air respirator operated in a pressure-demand or other positive pressure mode.
100.0 mg(Pb)/m ³	- Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
Escape:	- Any air-purifying full facepiece respirator with a high-efficiency particulate filter Any appropriate escape-type self-contained breathing apparatus.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Any supplied-air respirator that has a full facepiece and is operated in a

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pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

CLOTHING:

Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):

Protective clothing should meet the requirements for protective work clothing and equipment in 29 CFR 1910.1025(g).

GLOVES:

Employee must wear appropriate protective gloves to prevent contact with this substance.

LEAD (ELEMENTAL, INORGANIC & SOAPS):

Protective gloves should meet the requirements for protective work clothing and equipment in 29 CFR 1910.1025(g).

EYE PROTECTION

Employee must wear splash proof or dust resistant safety goggles to prevent eye contact with this substance.

Emergency eye wash: Where there is any possibility that an employee's eyes may be exposed to this substance, the employer should provide an eye wash fountain within the immediate work area for emergency use.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):

Protective eye equipment should meet the requirements for protective work clothing and equipment in 29 CFR 1910.1025(g).

AUTHORIZED - FISHER SCIENTIFIC, INC.
 CREATION DATE: 12/10/84 REVISION DATE: 09/10/93

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MERCURY
MERCURY
MERCURY

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

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SUBSTANCE IDENTIFICATION

SUBSTANCE: **MERCURY** CAS-NUMBER 7439-97-6

TRADE NAMES/SYNONYMS:
COLLOIDAL MERCURY; METALLIC MERCURY; NCI-C60399; QUICK SILVER;
INORGANIC MERCURY; RCRA U151; NA 2809; HYDRARGYRUM; ELEMENTAL MERCURY;
M-139; M-140; M-141; UN 2809; HG; ACC14020

CHEMICAL FAMILY:
Metal

MOLECULAR FORMULA: HG

MOLECULAR WEIGHT: 200.59

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=U FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: MERCURY PERCENT: 100
CAS# 7439-97-6

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:

MERCURY, ALL FORMS EXCEPT ALKYL (AS HG):
0.05 mg/m3 OSHA TWA (vapor) (skin); 0.1 mg/m3 OSHA ceiling (skin)
0.05 mg/m3 ACGIH TWA (vapor); 0.10 mg/m3 ACGIH TWA (aryl & inorganic) (skin)
(Notice of Intended Changes 1993-94)
0.05 mg/m3 NIOSH recommended TWA (vapor) (skin);
0.1 mg/m3 NIOSH recommended ceiling (skin)
0.01 ppm (0.1 mg/m3) DFG MAK TWA;
0.1 ppm (1.0 mg/m3) DFG MAK 30 minute peak, average value, 1 time/shift

MEASUREMENT METHOD: Hydrar(R) sorbent tube; acid; atomic absorption
spectrometry (cold); (NIOSH Vol. III # 6009).

Subject to SARA Section 313 Annual Toxic Chemical Release Reporting
Subject to California Proposition 65 cancer and/or reproductive toxicity
warning and release requirements- (July 1, 1990)

MERCURY:
1 pound CERCLA Section 103 Reportable Quantity

**OSHA revoked the final rule limits of January 19, 1989 in response to the
11th Circuit Court of Appeals decision (AFL-CIO v. OSHA) effective
June 30, 1993. See 29 CFR 1910.1000 (58 FR 35338)**

PHYSICAL DATA

DESCRIPTION: Odorless, silvery liquid with a metallic luster.

BOILING POINT: 674 F (357 C) MELTING POINT: -38 F (-39 C)

SPECIFIC GRAVITY: 13.5939 VAPOR PRESSURE: 0.002 mmHg @ 25 C

SOLUBILITY IN WATER: insoluble VAPOR DENSITY: 7.0

SOLVENT SOLUBILITY: Soluble in boiling sulfuric acid, nitric acid, lipids;
insoluble in alcohol, ether, hydrochloric acid, hydrogen bromide,
hydrogen iodide

VISCOSITY: 1.55 cP @ 20 C

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FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
Negligible fire hazard when exposed to heat or flame.

FIREFIGHTING MEDIA:

Dry chemical, carbon dioxide, water spray or regular foam
(1990 Emergency Response Guidebook, DOT P 5800.5).

For larger fires, use water spray, fog or regular foam
(1990 Emergency Response Guidebook, DOT P 5800.5).

FIREFIGHTING:

Move container from fire area if you can do it without risk. Apply cooling
water to sides of containers that are exposed to flames until well after fire
is out. Stay away from ends of tanks (1990 Emergency Response Guidebook,
DOT P 5800.5, Guide Page 60)

Use agents suitable for type of fire; use water in flooding amounts as a fog.
Avoid breathing corrosive and poisonous vapors, keep upwind

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49-CFR 172.101:
ORM-B

Department of Transportation labeling requirements 49-CFR 172.101 and
SUBPART E:
None

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49-CFR 173.860
EXCEPTIONS: None

Final rule on hazardous materials regulations (HMR, 49 CFR parts 171-180),
docket numbers HM-181, HM-181a, HM-181b, HM-181c, HM-181d and HM-204
Effective date October 1, 1991. However, compliance with the regulations is
authorized on and after January 1, 1991 (55 FR 52402, 12/21/90)

Except for explosives, inhalation hazards, and infectious substances, the
effective date for hazard communication requirements is extended to
October 1, 1993. (56 FR 47158, 09/18/91)

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101
Mercury-UN 2890

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
8 - Corrosive material

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG III

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101
AND SUBPART E:
Corrosive

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS, 49 CFR 173.164
NON-BULK PACKAGING: 49 CFR 173.164
BULK PACKAGING: 49 CFR 173.240

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101
PASSENGER AIRCRAFT OR RAILCAR: 35 kg
CARGO AIRCRAFT ONLY: 35 kg

TOXICITY

MERCURY:

TOXICITY DATA: 150 ug/m3/46 days inhalation: woman TCLO, 44,300 ug/m3/8 hours
inhalation: man TCLO, 29 mg/m3/30 hours inhalation: rabbit LCLO,
129 mg/kg/5 hours continuous skin man TDLO, mutagenic data (RTECS);
reproductive effects data (RTECS), tumorigenic data (RTECS)
CARCINOGEN STATUS: None
LOCAL EFFECTS: Irritant- inhalation
ACUTE TOXICITY LEVEL: Insufficient data
TARGET EFFECTS: Sensitizer- respiratory, dermal, neurotoxin; nephrotoxin,
poisoning may also affect the respiratory and gastrointestinal systems.
AT INCREASED RISK FROM EXPOSURE: Persons with chronic respiratory disease,
nervous system disorders and kidney disease

HEALTH EFFECTS AND FIRST AID

INHALATION:
MERCURY:
IRRITANT/SENSITIZER/NEUROTOXIN/NEPHROTOXIN
28 mg/m3 Immediately Dangerous to Life or Health.

ACUTE EXPOSURE- Inhalation of high levels of mercury vapor may cause almost immediate dyspnea, cough, fever, nausea, vomiting, diarrhea, headache, stomatitis, salivation, gingivitis, a metallic taste, and cardiac abnormalities. Respiratory irritation may occur with chest pain and tightness. Symptoms may resolve or may progress to necrotizing bronchiolitis, pneumonitis, pulmonary edema, pneumothorax, interstitial fibrosis, and death. Acidosis and renal damage may also occur. Allergic reactions that may occur in previously exposed persons include dermatitis, encephalitis, and death. Loss of libido and impotence have been reported in men acutely exposed to metallic mercury vapor. Metal fume fever, an influenza-like illness, may occur due to the inhalation of freshly formed metal oxide particles sized below 1.5 microns and usually between 0.02-0.05 microns. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur. Tolerance to fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours.

CHRONIC EXPOSURE- Inhalation of mercury vapor over a long period may cause mercurialism, which is characterized by fine tremors and erethism. Tremors may affect the hands first, but may also become evident in the face, arms, and legs. Erethism may be manifested by abnormal shyness, blushing, self-consciousness, depression or despondency, resentment of criticism, irritability or excitability, headache, fatigue, and insomnia. In severe cases, hallucinations, loss of memory, and mental deterioration may occur. Concentrations as low as 0.03 mg/m³ have induced psychiatric symptoms in humans. Renal involvement may be indicated by proteinuria, albuminuria, enzyuria, and anuria. Other effects may include salivation, gingivitis, stomatitis, loosening of the teeth, blue lines on the gums, diarrhea, weight loss, anorexia, speech and sensory disorders, unsteady gait, chronic pneumonitis and mild anemia. Repeated exposure to mercury and its compounds may result in sensitization. Women occupationally exposed have reported menstrual disturbances, reduced ovulation and an increased risk of spontaneous abortion. Intrauterine exposure may result in tremors and involuntary movements in the infants. Mercury is excreted in breast milk. Reproductive effects have been reported in animals.

FIRST AID- Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Maintain airway and blood pressure and administer oxygen if available. Keep affected person warm and at rest. Treat symptomatically and supportively. Administration of oxygen should be performed by qualified personnel. Get medical attention immediately.

SKIN CONTACT:

MERCURY:
SENSITIZER/NEUROTOXIN/NEPHROTOXIN.

ACUTE EXPOSURE- Direct contact with liquid may cause irritation and redness. Small amounts of mercury may be absorbed through intact skin. Allergic reactions that may occur in previously exposed persons include dermatitis, encephalitis, and death. Subcutaneous introduction, from handling broken thermometers, may result in local inflammation, granulomatous skin reactions, and slight signs of mercury poisoning including digestive disorders, metallic taste in the mouth, and neuropsychic disorders.

CHRONIC EXPOSURE- Prolonged or repeated exposure may result in dermal sensitization and systemic effects as detailed in chronic inhalation exposure.

FIRST AID- Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

EYE CONTACT:

MERCURY:

ACUTE EXPOSURE- Direct contact with liquid may cause irritation and redness. Animal studies indicate diffusion and absorption of mercury into the tissues of the eye may occur. No clinical signs of conjunctivitis or inflammation occurred.

CHRONIC EXPOSURE- Mercury exposure from inhalation, ingestion, or skin contact may be indicated by mercurialentis, discoloration of the crystalline lens, on slit lamp examination of the eye.

FIRST AID- Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

INGESTION:

MERCURY:

NEUROTOXIN/NEPHROTOXIN.

ACUTE EXPOSURE- May cause burning of the mouth and throat, thirst, nausea and vomiting. Metallic mercury is not usually absorbed sufficiently from the gastrointestinal tract to induce an acute toxic response. Rarely, a large single dose may result in signs and symptoms of chronic inhalation if sufficient amounts of mercury are retained in the body.

CHRONIC EXPOSURE- Repeated ingestion of small amounts of mercury may result

in the absorption of sufficient amounts to produce toxic effects as detailed in chronic inhalation exposure.

FIRST AID- Remove by gastric lavage or emesis. Maintain blood pressure and airway. Give oxygen if respiration is depressed. Do not perform gastric lavage or emesis if victim is unconscious. Get medical attention immediately (Dreisbach, Handbook of Poisoning, 12th Ed.). Administration of gastric lavage or oxygen should be performed by qualified medical personnel.

ANTIDOTE:

The following antidote has been recommended. However, the decision as to whether the severity of poisoning requires administration of any antidote and actual dose required should be made by qualified medical personnel.

MERCURY POISONING:

Give dimercaprol, 3 mg/kg (or 0.3 mL/10 kg) every 4 hours for the first 2 days and then 2 mg/kg every 12 hours for a total of 10 days if necessary. Dimercaprol is available as a 10% solution in oil for intramuscular administration. Hemodialysis will speed the removal of the mercury-dimercaprol complex. Penicillamine is also effective. Give up to 100 mg/kg/day (maximum 1 gr/day) divided into 4 doses for no longer than 1 week. If a longer administration period is warranted, dosage should not exceed 40 mg/kg/day. Give the drug orally half an hour before meals. A chelating agent should be continued until the urine mercury level falls below 50 ug/24 hours (Dreisbach, Handbook of Poisoning, 12th Ed.). Antidote should be administered by qualified medical personnel.

REACTIVITY

REACTIVITY:

Stable under normal temperatures and pressures.

INCOMPATIBILITIES:

MERCURY:

ACETYLENE: Formation of explosive compound.

ACETYLINIC COMPOUNDS: Formation of explosive compound.

ALUMINUM: Corrodes.

AMINES: May form explosive compounds.

AMMONIA + MOISTURE: Forms explosive compound.

BORON DIODPHOSPHIDE: Ignites in contact with mercury vapors.

BROMINE: Violent reaction.

3-BROMOPROPYNE: Explosion hazard.

CALCIUM: Amalgam formation @ 390 C is violent.

CHLORINE: Ignites @ 200-300 C.

CHLORINE DIOXIDE: Explodes.

COPPER (AND ALLOYS): May be attacked.

ETHYLENE OXIDE + TRACES OF ACETYLENE: May form explosive acetylides.

LITHIUM: Amalgam formation is violently exothermic and may be explosive.

METHYL AZIDE: Produces shock sensitive mixture.

METHYLSILANE + OXYGEN: Produces shock sensitive mixture.

NITRIC ACID + ALCOHOLS: Forms fulminates capable of detonation.

OXALIC ACID: Forms shock sensitive compound.

OXIDANTS: Violent reaction.

PEROXYFORMIC ACID: Explosive reaction.

POTASSIUM: Amalgam formation is vigorously exothermic and may be explosive.

RUBIDIUM: Violent exothermic reaction.

SILVER PERCHLORATE + 3-HEXYNE: Explodes.

SILVER PERCHLORATE + 2-PENTYNE: Explodes.

SODIUM: Amalgam formation is violently exothermic.

SODIUM CARBIDE: Vigorous reaction.

SULFURIC ACID (HOT): Reacts.

TETRACARBONYLNICKEL + OXYGEN: Produces shock sensitive mixture.

DECOMPOSITION:

Thermal decomposition products may include highly toxic vapors of mercury and mercury oxides.

POLYMERIZATION:

Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

STORAGE AND DISPOSAL

Observe all federal, state and local regulations when storing or disposing of this substance.

Storage

Store away from incompatible substances.

Disposal

Disposal must be in accordance with standards applicable to generators of hazardous waste, 40 CFR 262 EPA Hazardous Waste Number U151.

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Mercury - Regulatory level: 0.2 mg/l (TCLP-40 CFR 261 Appendix II)
materials which contain the above substance at or above the TCLP regulatory level meet the EPA toxicity characteristic, and must be disposed of in accordance with 40 CFR part 262, EPA Hazardous Waste Number D009.

CONDITIONS TO AVOID

May burn but does not ignite readily. Flammable, poisonous gases may accumulate in tanks and hopper cars. May ignite combustibles (wood, paper, oil, etc.).

SPILL AND LEAK PROCEDURES

WATER SPILL:
The California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) prohibits contaminating any known source of drinking water with substances known to cause cancer and/or reproductive toxicity.

OCCUPATIONAL SPILL:
Do not touch spilled material. Stop leak if you can do it without risk. For small spills, take up with sand or other absorbent material and place into containers for later disposal. A mercury spill kit may also be used for small spills in the workplace. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry.

Reportable Quantity (RQ): 1 pound
The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity for this substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
Provide local exhaust ventilation system to meet published exposure limits.

RESPIRATOR:
The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH criteria documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z.
The specific respirator selected must be based on contamination levels found in the work place, must not exceed the working limits of the respirator and be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

MERCURY, ELEMENTAL:

- 0.5 mg/m³- Any chemical cartridge respirator with cartridge(s) providing protection against mercury.*
Any supplied-air respirator.
Any self-contained breathing apparatus.
- 1.25 mg/m³- Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with a canister providing protection against mercury.*
- 2.5 mg/m³- Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Any supplied air respirator that has a tight fitting facepiece and is operated in a continuous-flow mode.
Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against mercury.*
Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against mercury.*
Any powered, air-purifying respirator with a tight fitting facepiece and a canister providing protection against mercury.
- 28 mg/m³- Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode.
Escape- Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against mercury.
Any appropriate escape-type, self-contained breathing apparatus.

* End of service life indicator (ESLI) required.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS.

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

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Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

CLOTHING:
Employee must wear appropriate protective (impervious) clothing and equipment to prevent any possibility of skin contact with this substance.

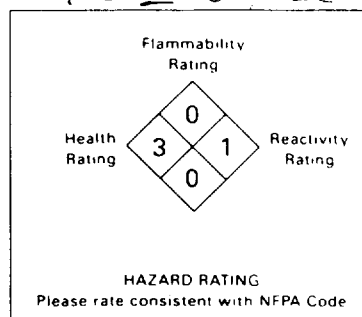
GLOVES:
Employee must wear appropriate protective gloves to prevent contact with this substance.

EYE PROTECTION:
Employee must wear splash-proof or dust-resistant safety goggles and a face shield to prevent contact with this substance.

Emergency wash facilities
Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.

AUTHORIZED: FISHER SCIENTIFIC, INC.
CREATION DATE: 01/31/85 REVISION DATE: 09/10/93

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SECTION I NAME AND PRODUCT

SECTION I NAME AND PRODUCT	
MANUFACTURER'S NAME A.I.T. INDUSTRIES, INC.	CONTACT Dennis R. Raffaelli
ADDRESS (STREET, CITY, STATE AND ZIP CODE) 2020 Hammond Drive, Schaumburg, IL 60195	EMERGENCY TELEPHONE NO 312/397-1770
TRADE NAME, COMMON NAME OR SPECIFICATION Nickel Plated Abrasive Products	APPROVED BY <i>Dennis R. Raffaelli</i> DATE November 25, 1985
CHEMICAL FAMILY OR PRODUCT TYPE Electroplated Nickel	

SECTION II COMPOSITION

[illegible]

*Materials are regulated by OSHA 29 CFR 1910. 1200, Hazard Communication Standard and/or the Massachusetts General Law Chapter 111F, Right To Know Regulations

SECTION III PHYSICAL AND CHEMICAL DATA

BOILING POINT	2730C 4946F	MELTING POINT	1453C 2648F	SPECIFIC GRAVITY	8.9
VAPOR PRESSURE	20C essentially	PERCENT VOLATILE BY VOL.	N/A	VAPOR DENSITY	N/A
EVAPORATION RATE	N/A	SOLUBILITY IN WATER	Insoluble	SOLUBILITY IN ALCOHOL	N/A
SOLUBILITY IN OTHER SOLVENT	Strong Acids	APPEARANCE AND ODOR	Silver Grey Metallic, Odorless		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT	N/A	(METHOD USED)	FLAMMABLE LIMITS	LEL	UEL
EXTINGUISHING MEDIA	CO ₂ , Water, Dry Chemicals, Foam				
SPECIAL FIRE FIGHTING PROCEDURES	Approved self-contained breathing apparatus needed				
EXPLOSION POTENTIAL	None				

SECTION V HEALTH, FIRST AID AND MEDICAL DATA

PRIMARY ROUTE(S) OF ENTRY	ACUTE AND CHRONIC HEALTH EFFECTS AND EFFECTS OF OVEREXPOSURE	FIRST AID AND MEDICAL INFORMATION
INHALATION Dust	Acute: May cause coughing, shortness of breath and wheezing. Chronic: See below	Remove to fresh air. Obtain medical help if needed.
INGESTION	No known adverse effects, but ingestion is not recommended.	Obtain first aid or medical assistance, if needed.
SKIN CONTACT & ABSORPTION	Acute: Not absorbed through skin. Chronic: Dermatitis may develop.	Obtain first aid or medical help for "nickel itch".
EYE	Acute: May cause irritation of eyes. Chronic: Nickel can cause damage to Cornea.	Wash with large amounts of water. Obtain medical help if needed.
OTHER POTENTIAL HEALTH RISKS	Nickel dust has been associated with destruction of nasal tissues, asthmatic lung disease, & lung and nasal cancer.	Obtain medical help if needed.

102372

SECTION VI CORROSIVITY AND REACTIVITY DATA

STABILITY UNSTABLE ☐ STABLE ☒POLYMERIZATION MAY OCCUR ☐ WILL NOT OCCUR ☒

INCOMPATIBILITY (MATERIALS TO AVOID)

Strong Acids, HCL, HNO₃

DECOMPOSITION PRODUCTS

Hydrogen gas, toxic gases and vapors (such as nickel carbonyl and oxides of nitrogen) may be released in a fire involving nickel or in a decomposition of nickel compounds.

CONDITIONS TO BE AVOIDED

Nickel compounds NAIF

SECTION VII STORAGE, HANDLING AND USE PROCEDURES

NORMAL STORAGE AND HANDLING

Comply with American National Standards Institute B7.1 and OSHA act which governs storage, handling and use of this product.

NORMAL USE

Same as above

STEPS TO BE TAKEN IN CASE OF LEAKS OR SPILLS

N/A

WASTE DISPOSAL METHOD

In accordance with Local, State and Federal regulations.

SECTION VIII PERSONAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Approved dust respirator needed (see OSHA 29CFR 191.134)

VENTILATION

LOCAL Recommended

MECHANICAL
(GENERAL) Recommended

OTHER

PROTECTIVE GLOVES As desired by user.

EYE PROTECTION Recommended, see OSHA 29CFR 1910.133 (eye and face protection)

OTHER EQUIPMENT Ear protection recommended when using this product.

MEASURES TO BE TAKEN DURING REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT THAT HAS BEEN IN CONTACT WITH THIS MATERIAL

Dust should be kept to a minimum. The use of an air hose in cleaning of machine is not recommended. Swarf generated with the use of this product should be disposed of according to Local, State and Federal regulations.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE Comply with American National Standards Institute

OTHER PRECAUTIONS B7.1, which governs handling and storage

FOR COMPANY USE

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**NAIF = NO APPLICABLE INFORMATION FOUND

***N/A = NOT APPLICABLE

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Rev. 5/84

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SILVER
SILVER
SILVER

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY CONTACTS:
GASTON L. PILLORI: (201) 796-7100
AFTER BUSINESS HOURS; HOLIDAYS:
(201) 796-7523
CHEMTREC ASSISTANCE: (800) 429-9300

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SUBSTANCE IDENTIFICATION

SUBSTANCE: ***SILVER***

CAS-NUMBER 7440-22-4

TRADE NAMES/SYNONYMS:
ALGAEDYN; ARGENTUM; C. I. 77820; E 20; L 3; SHELL SILVER; SILFLAKE 135;
SILPOWDER 130; SILVER ATOM; SILVER ELEMENT; SILVER METAL; SILVEST TCG 1;
SR 999; TCG 7R; V 9; XA 208; S-163; S-167; S-166; AG; ACC20770

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: AG

MOLECULAR WEIGHT: 107.868

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=3 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: SILVER

PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
SILVER, METAL (AS AG):
0.01 MG/M3 OSHA TWA
0.1 MG/M3 ACGIH TWA (DUST AND FUME)

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: SOFT, DUCTILE, LUSTROUS, WHITE SOLID.

BOILING POINT: 3852 F (2122 C) MELTING POINT: 1763 F (962 C)

SPECIFIC GRAVITY: 10.5 VAPOR PRESSURE: 100 MMHG @ 1865 C

SOLUBILITY IN WATER: INSOLUBLE

SOLVENT SOLUBILITY: SOLUBLE IN NITRIC ACID, HOT SULFURIC ACID, POTASSIUM CYANIDE, ALKALI HYDROXIDES, ALKALI CYANIDE SOLUTIONS; INSOLUBLE IN ALKALIES.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLECTIBLE FIRE HAZARD IN METALLIC FORM; HOWEVER, DUST, POWDER, OR FUMES ARE FLAMMABLE OR EXPLOSIVE WHEN EXPOSED TO HEAT OR FLAMES.

FIREFIGHTING MEDIA:
USE DRY SAND, DOLOMITE, GRAPHITE, SODIUM CHLORIDE, SODA ASH, OR APPROPRIATE METAL-EXTINGUISHING POWDER. DO NOT APPLY WATER TO BURNING MATERIAL (NFPA FIRE PROTECTION HANDBOOK, 16TH EDITION).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAME WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN CARGO AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW AND LET FIRE BURN (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 32).

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EXTINGUISH USING AGENT FOR TYPE OF FIRE. AVOID BREATHING FUMES FROM BURNING MATERIAL.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
*FLAMMABLE SOLID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND 172.402:
*FLAMMABLE SOLID

*HAZARD CLASSIFICATION AND LABEL APPLY TO DUST AND POWDER FORM ONLY.

TOXICITY

SILVER:
TOXICITY DATA: TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE.
ACUTE TOXICITY LEVEL: NO DATA AVAILABLE.
TARGET EFFECTS: NO DATA AVAILABLE.

HEALTH EFFECTS AND FIRST AID

INHALATION:

SILVER:
ACUTE EXPOSURE- IMPREGNATION OF THE MUCOUS MEMBRANES BY FINE PARTICLES OF METALLIC SILVER MAY CAUSE LOCALIZED ARGYRIA.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE (2-25 YEARS) TO SILVER DUSTS MAY CAUSE A PERMANENT LOCALIZED BLUE-GREY DISCOLORATION OF THE SKIN, MUCOUS MEMBRANES, AND EYES (ARGYRIA), WITHOUT EVIDENCE OF TISSUE REACTION. DISCOLORATION IS FIRST APPARENT IN THE CONJUNCTIVA, WITH SOME LOCALIZATION IN THE INNER CANTHUS. IN SEVERE CASES, THE SKIN MAY BECOME BLACK WITH A METALLIC LUSTER AND THE EYES MAY BE AFFECTED TO THE POINT THAT THE LENS AND VISION ARE DISTURBED. THE RESPIRATORY TRACT MAY ALSO BE AFFECTED PRODUCING A MILD CHRONIC BRONCHITIS.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

SILVER:
ACUTE EXPOSURE- IMPREGNATION OF THE SKIN BY FINE PARTICLES OF METALLIC SILVER MAY CAUSE LOCALIZED ARGYRIA.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO SILVER DUST MAY CAUSE LOCALIZED ARGYRIA.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

SILVER:
ACUTE EXPOSURE- CONTACT WITH SILVER DUST MAY CAUSE LOCALIZED ARGYRIA. APPLICATION OF SMALL PARTICLES OF METALLIC SILVER IN THE ANTERIOR CHAMBER OF RABBIT EYES CAUSED LITTLE REACTION; CAUSED ATROPHIC CHANGES IN THE RETINA WHEN PLACED IN THE VITREOUS; AND REACTED WITH SURROUNDING TISSUE WHEN PLACED IN THE CORNEA.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO SILVER DUSTS MAY CAUSE LOCALIZED ARGYRIA.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

SILVER:
ACUTE EXPOSURE- INGESTION OF SILVER BY EXPERIMENTAL ANIMALS WAS RAPIDLY AND ALMOST COMPLETELY ELIMINATED IN THE FECES WITHIN DAYS.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:

NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:

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SILVER:

ACETYLENE (AND COMPOUNDS): FORMS EXPLOSIVE SILVER ACETYLIDE.
AMMONIA: FORMS EXPLOSIVE COMPOUNDS.
AZIRIDINE: FORMATION OF EXPLOSIVE COMPOUNDS.
BROMOAZIDE: PROBABLE EXPLOSION.
1-BROMO-2-PROPYNE: EXPLOSION HAZARD.
CARBON: REACTS VIOLENTLY.
CHLORINE TRIFLUORIDE: POSSIBLE IGNITION.
ETHYLENEIMINE: FORMS EXPLOSIVE COMPOUND.
ETHYLENE OXIDE + TRACES OF ACETYLENE: MAY FORM EXPLOSIVE SILVER ACETYLIDE.
ETHYL HYDROPEROXIDE: EXPLOSION HAZARD.
HYDROGEN PEROXIDE: IGNITION OR VIOLENT DECOMPOSITION.
IODOFORM: REACTS WITH INCANDESCENCE.
NITRIC ACID + ETHYL ALCOHOL: FORMS EXPLOSIVE COMPOUNDS.
OXALIC ACID: FORMS EXPLOSIVE COMPOUND.
OZONIDES: DECOMPOSED, POSSIBLY EXPLOSIVELY.
PERMONOSULFURIC ACID: EXPLOSIVE DECOMPOSITION.
PEROXYFORMIC ACID: REACTS EXPLOSIVELY.
SULFURIC ACID: REACTS VIOLENTLY.
TARTARIC ACID: FORMATION OF EXPLOSIVE SALT.
ZINC + ELECTROLYTES: POSSIBLE SPONTANEOUS IGNITION.

DECOMPOSITION:

THERMAL DECOMPOSITION MAY RELEASE TOXIC AND/OR HAZARDOUS GASES.

POLYMERIZATION:

HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

****STORAGE****

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

AVOID DISPERSION OF DUST IN AIR. FINELY DIVIDED PARTICLES, DUST, OR FUMES MAY BE FLAMMABLE OR EXPLOSIVE. KEEP AWAY FROM SPARKS OR IGNITION SOURCES.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:

FOR LARGE SPILLS, SWEEP UP WITH A MINIMUM OF DUSTING AND PLACE INTO SUITABLE CLEAN, DRY CONTAINERS FOR RECLAMATION OR LATER DISPOSAL.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:

PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET THE PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS, OR DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

SILVER (METAL AND SOLUBLE COMPOUNDS):

0.25 MG/M3- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

0.5 MG/M3- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

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ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE,
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

20.0 MG/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND OPERATED IN
A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY
PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE
DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND
OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY
SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER
POSITIVE PRESSURE MODE.

CLOTHING:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT
TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:

EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS
SUBSTANCE.

EYE PROTECTION:

EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT
CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

EMERGENCY WASH FACILITIES:

WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE
EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN
AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 12/31/84 REVISION DATE: 03/27/89

-ADDITIONAL INFORMATION-

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MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

120 ERIE BOULEVARD

SCHENECTADY, N.Y. 12305



NO. 124

VANADIUM
METAL/POWDER

DATE October 1983

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: VANADIUM METAL/POWDER

OTHER DESIGNATIONS: V, CAS #007 440 622

MANUFACTURER: Available from several suppliers, including:

Alpha Products

P.O. Box 299

Danvers, MA 01923 Tel: (617) 777-1970

SECTION II. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Vanadium Metal	-	10-hr TWA 1.0 mg/m ³ * (Metal particulate)
Vanadium Pentoxide** (MSDS #88)	-	8-hr TWA 0.05 mg/m ³ * (Respirable V ₂ O ₅ dust & fume) ^{2 5}
*NIOSH proposed in 1977.		
**Current ACGIH (1983) TLV for V ₂ O ₅ . (When metal is heated oxidation can occur.)		
For airborne sample analysis vanadium oxides can be dissolved with 0.01N NaOH, leaving metal behind for separate determination.		

SECTION III. PHYSICAL DATA

Boiling point, deg C, 1 atm -----	3000	Specific gravity, 18.7 C -----	6.1
Vapor pressure at 2300 C, mm Hg -----	ca 1.5	Melting point, deg C -----	ca 1900
Water solubility -----	Insoluble	Atomic weight -----	50.9

Appearance & Odor: Light gray powder or white, lustrous bulk solid; no odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	Lower	Upper
	Dust* Layer 490 C Cloud 500 C	Vanadium metal dust*	0.22 oz/ft ³	—

Very hot vanadium can burn in air. Extinguish metal fire with dry chemical. (Contact supplier to obtain fire control recommendations.) When dispersed in air as dust, it can be exploded by an ignition source*. However, it has a low explosibility index (0.1) and low ignition sensitivity (0.3) on scale of 10.

Firefighters need self-contained breathing apparatus with full facepiece, operated in a pressure demand or positive pressure mode when vanadium metal is involved in fire.

*Particle size is 100% below 75 µm. Reported minimum ignition energy is 60 mJ for dust cloud.

SECTION V. REACTIVITY DATA

Massive metal is relatively inert to O₂, N₂, H₂ and H₂O at ambient conditions, but it reacts when heated and still more readily if powdered. When heated in air, vanadium oxidizes to brownish-black trioxide, blue-black tetroxide or yellow-red pentoxide, depending on the temperature. It reacts in Cl₂ at 180 C to give VCl₃. It reacts with hot nitric, hydrofluoric, Conc. sulfuric, and perchloric acids, but resists hydrochloric and Dil. sulfuric acids and alkaline solutions. Vanadium has high solubility in iron (ferrovanadium alloys) and a pronounced tendency to carbide formation. It and some of its alloys are deoxidizers in metallurgical processes. Vanadium reaction products can pose toxic hazards. The higher valence vanadium compounds generally have the greater toxic potential.

SECTION VI. HEALTH HAZARD INFORMATION	TLV 1.0 mg/m ³ for metal (See Sect II)
<p>Vanadium is an essential trace element in the chick and rat and may be in man also (controversial). It is ubiquitously present in environment and biological systems. Inhalation of vanadium metal aerosols is not highly toxic, but when excessive, has produced catarrhal bronchitis, moderate interstitial pneumosclerosis, and, systemically, some adverse liver and kidney effects. The chief effects were on the lungs, but no fibrosis or lesions are reported. Ingestion produced catarrhal gastritis.</p> <p>Vanadium pentoxide is a primary irritant and can promote sensitization. Its presence increases adverse inhalation and contact effects to the lungs, skin and eyes; "greenish-black tongue" occurs on ingestion. (See MSDS #88).</p> <p>Ferrovandium alloy has been found to be more toxic than free vanadium metal, because it increases the solubility of vanadium in biologic material. FIRST AID:</p> <p><u>Eye Contact:</u> Flush immediately and thoroughly with running water for 15 minutes, including under eyelids. Get medical help.</p> <p><u>Skin Contact:</u> Wash area with soap and water. Get medical help for irritation.</p> <p><u>Inhalation:</u> Remove to fresh air. Restore and/or support breathing. Get medical help.</p> <p><u>Ingestion:</u> Contact physician. Gastric lavage may be needed.</p>	
SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES	
<p>Notify safety personnel of spills. Clean-up personnel need protection against inhalation of dust or fume. Pick up spills and place in appropriate containers for disposal, keeping airborne particulate at a minimum when cleaning up.</p> <p>For vanadium recovery techniques, pollution abatement methods, and detection and treatment processes, see reference #40.</p> <p>DISPOSAL: Recover waste when possible and ship to supplier for reprocessing. An approved landfill is recommended for waste material that can not be recovered or salvaged. Follow Federal, State, and Local regulations.</p>	
SECTION VIII. SPECIAL PROTECTION INFORMATION	
<p>Provide adequate ventilation to meet TLV requirement in the workplace. (Exhaust ventilation may require filtration to protect environment.) Approved NIOSH/MESA respirator as specified under provision 30CFR11. Exposure greater than 70 mg/m³ requires self-contained breathing apparatus with full facepiece operated in positive pressure mode. Provide chemical safety goggles and/or faceshield (8 inch min). Wear rubber gloves and protective clothing as needed to avoid skin contact.</p> <p>Provide preplacement and periodic medical examinations including comprehensive medical histories, chest x-ray, pulmonary function tests. Particular emphasis on respiratory tract, skin and eyes. Retention of medical records for 30 years after employment has been recommended by NIOSH.</p>	
SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS	
<p>Store in closed containers in a cool, dry, well-ventilated area. Protect containers from damage. Use good housekeeping practices to prevent accumulation of dust and follow cleaning techniques that will keep airborne particulate at a minimum.</p> <p>Avoid inhalation of dust, vapor or fume when generated. Prevent contact with eyes and skin. Sensitization may occur with repeated or heavy exposures (see Sect. VI).</p> <p>Use only with adequate ventilation.</p> <p>Clean work clothes should be supplied daily when vanadium contamination occurs. Follow good personal hygiene practice. Chronic exposure effects are not fully known.</p> <p><u>Ref.</u> "Vanadium. Medical and Biological Effects of Environmental Pollutants", National Academy of Sciences, Washington, DC, 1974.</p>	
DATA SOURCE(S) CODE: 2-10,12,14,20,40,41 (MSDS 88)	
<p>Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, General Electric Company extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.</p>	APPROVALS: MIS/CRD <i>J. M. Nelson</i>
	INDUST. HYGIENE/SAFETY <i>JN 10-31-83</i>
	MEDICAL REVIEW: 14 November 1983

Material Safety Data Sheet
 Genium Publishing Corporation
 1145 Catalyn Street
 Schenectady, NY 12303-1836 USA
 (518) 377-8855



No. 176

ZINC METAL/POWDER

Issued: March 1986

SECTION 1. MATERIAL IDENTIFICATION

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MATERIAL NAME: ZINC METAL/POWDER

OTHER DESIGNATIONS: Spelter; CAS #7440-66-6; ASTM B-69; Zn

DESCRIPTION: Shining white, malleable, blue-gray metal; bars, sheets, wire, foil, flake, and powder.

MANUFACTURERS: Available from several suppliers, including: Meadowbrook Corp., 30 Rockefeller Plaza, New York City, NY 10112; Telephone: (212) 582-0420

COMMENTS: Commonly used for galvanizing iron and other metals, electroplating, battery cells, and as an alloying component of brass or bronze. Zinc oxide is used as a pigment in cosmetics and ointments.

HMIS

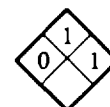
H: 1

F: 1

R: 1

PPE: *

* See Sect. 8



R 0

I 2

S 1

K -

SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

ZINC; CAS #7440-66-6

>98

OSHA PEL* as Zinc Oxide:
5 mg/m³

* Current ACGIH (1985-86) TWA is 5 mg/m³ as ZnO fume, while STEL for ZnO is 10 mg/m³. Metallic zinc particulates can be considered a nuisance dust.

Human, Inhalation TCLo:
1 hr.

SECTION 3. PHYSICAL DATA

Boiling Point ... 1664.6°F (907°C)

Melting Point ... 788°F (420°C)

Vapor Pressure ... 736°C mm Hg 100

Percent Volatile by Volume ... Not Found

Water Solubility ... Insoluble

Molecular Weight ... 65.38

Vapor Density (Air = 1) ... Not Found

Evaporation Rate ... Not Found

Specific Gravity (H₂O = 1) ... 7.14

Appearance and odor: Bright gray-white metallic solid, foil or particulate. No odor.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temp.

Flammability Limits In Air

Not Found

Powder/650 millijoules

Dust Cloud Exp. Level

NEPA CLASSIFICATION: 1.

EXTINGUISHING MEDIA: Special mixtures of dry chemical or clean, dry sand. Dust will form explosive mixtures with air. Bulk dust in a damp state may generate heat through chemical reaction and hydrogen gas. **UNUSUAL FIRE/EXPLOSION HAZARDS:** Zn may generate toxic fumes when heated, causing metal fume fever (see sect. 6). Fire fighters should use self-contained breathing apparatus when fighting fires involving zinc or zinc powder. **SPECIAL FIRE-FIGHTING PROCEDURES:** Zinc and zinc powder will burn in chlorine gas. Care should be taken to ensure that fires involving bulk quantities of zinc powder that are extinguished with water do not generate heat or possible hydrogen gas with subsequent reignition through the reaction of zinc powder and water. Concentrations of zinc oxide powder should remain open and not be sealed to allow safe drying.

SECTION 5. REACTIVITY DATA

Zinc metal/powder is stable. Hazardous polymerization cannot occur.

CHEMICAL INCOMPATIBILITIES: Contact with acids or alkaline hydroxides will yield hydrogen gas. Zinc may react with halogenated hydrocarbon solvents to form salts and hydrogen gas. The combination of zinc and carbon disulfide will result in an incandescent reaction.

CONDITIONS TO AVOID: Bulk zinc dust should be kept in dry, well-ventilated storage to prevent reaction with water and generation of hydrogen gas. Zn powder reacts explosively with manganese chloride. Zn is resistant to fluorine, chlorine, and bromine, but it reacts strongly with these halogens in the presence of water vapor.

HAZARDOUS DECOMPOSITION PRODUCTS: Zinc and zinc powder will react with water to generate hydrogen gas.

COMMENTS: When combined with oxygen, zinc or zinc powder will generate a fume that can result in metal fume fever (see sect. 6).

SECTION 6. HEALTH HAZARD INFORMATION | TLV

This product is not considered a carcinogen by the NTP, OSHA, or IARC.

SUMMARY OF RISKS: Zinc metal in most forms is not toxic and is not readily absorbed through the skin, GI tract, or lungs. Zn is considered essential to life. Although most inorganic Zn compounds are potential causes of gastroenteric irritation, a high-level dose is relatively nontoxic when ingested. Inhalation of zinc fumes normally generated by zinc and extreme heat may cause metal fume fever, which is accompanied by dryness and irritation of the throat, coughing and dyspnea, a feeling of weakness, muscle pain, and general malaise. Removal from exposure will normally alleviate symptoms, with no residual or chronic effects.

TARGET ORGANS: Lungs, skin.

PRIMARY ENTRY: inhalation, dermal contact.

ACUTE EFFECTS: Inhalation of high levels of zinc fumes may cause metal fume fever.

CHRONIC EFFECTS: Prolonged skin contact may cause a drying dermatitis. Zinc and zinc powder have little history of causing chronic effects.

FIRST AID: **EYE CONTACT:** Flush well with running water to remove particulates; get medical attention if irritation persists.* **SKIN CONTACT:** For cuts, dermal abrasion, irritation, or thermal burns, get medical attention.*

INHALATION: Remove person to fresh air; get medical attention if symptoms persist.* **INGESTION:** Get medical help if large amount is ingested.

* GET MEDICAL ASSISTANCE = In plant, paramedic, community.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Notify safety personnel of large powder spills. Clean up, minimizing dust generation, heat, sources of ignition, and moisture. Approved, grounded vacuum cleaners may be used for final cleanup. Place picked-up powder in closed, pressure-vented, dry metal containers.

DISPOSAL: Deposit unsalvageable waste in an approved landfill per Federal, state, and local regulations. Zinc powder should not be shipped if it is wet.

COMMENTS: Consider EPA Code D 001 or D 003 for Zn powder disposal.

SECTION 8. SPECIAL PROTECTION INFORMATION

GOGGLES: Wear safety goggles to prevent eye contact with particulates.

GLOVES: Wear tightly woven, nonstatic-generating, protective clothing. Special protective clothing is needed for work with hot or molten Zn.

RESPIRATOR: Use NIOSH-approved respirator when dust/fume exceeds the TLV.

VENTILATION: Provide local (explosion-proof) exhaust ventilation to meet TLV requirements. An approved dust-collection system is needed to gather airborne particulates.

OTHER: Preplacement and periodic examination of personnel is suggested. Eyewash stations should be accessible outside the use area. Use of contact lenses in areas of Zn particulate generation should be prohibited because they pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Solid zinc metal does not need special storage segregation; however, zinc powder should be stored dry in a storage area free from ignition sources, chlorine, bromine, or fluorine gas and/or acids.

SPECIAL HANDLING/STORAGE: Follow approved cleaning techniques for zinc powder. Good handling is necessary to control powder dispersal and prevent generation of airborne particulates.

ENGINEERING CONTROLS: Facilities for handling large amounts of zinc powder require special design; approved procedures; use of grounded, electrical, nonsparking tools; and emergency planning for fire and spills.

COMMENTS: See NFPA 491M

NOT designated as a hazardous substance by EPA (40 CFR 116)

DOT Classification: Zn Powder - Flammable Solid
UN1436

Data Source(s) Code: 2-12, 14, 26, 31, 37, 41, 59, 61, 62, 82, 84, OW

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Approvals

Indust. Hygiene/Safety

Medical Review

ORION MATERIAL SAFETY DATA SHEET

SHEET 1 OF 2

Orion Research Incorporated
THE SCHRAFFT CENTER
529 MAIN STREET BOSTON, MA 02129 USA
TELEPHONE 617-242-3900

13-641 892

I. PRODUCT IDENTIFICATION

PRODUCT NAME Cyanide Standard 100 ± 5 ppm CN-	CATALOG NO. 940607	EFFECTIVE DATE 12/19/88
HAZARDOUS SHIPMENT LABELLING: DOT Both: Sodium Hydroxide Solution - U.N. No. 1824 Corrosive	IATA	
PREPARED BY <i>James E. Sporn</i>	TITLE Safety Chemist	
APPROVED BY <i>Lynn Orlando</i>	TITLE Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTITY INFORMATION)

HAZARDOUS COMPONENTS * SPECIFIC CHEMICAL IDENTITY, COMMON NAME(S)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD LO
Sodium Hydroxide (NaOH)	1310-73-2	0.40	2mg/m ³	C2mg/m ³	ORL-RBT 500mg/kg
Sodium Cyanide (NaCN)	143-33-9	** 0.01	5mg (CN) per m ³ (skin)	5mg/m ³ (skin)	ORL-HMN 2857g/kg
***De-ionized Water	NA	99.59	None	None	NA

III. PHYSICAL DATA

BOILING POINT 760 mm Hg > 100°C	FREEZING POINT -2°C
SPECIFIC GRAVITY (H ₂ O = 1) ≈ 1.03	VAPOR PRESSURE @ NA
pH @ 25 °C Strongly alkaline (>10)	SOLUBILITY IN WATER, % BY WT. @ Miscible
VOLATILES, % BY WT. NA	EVAPORATION RATE (BUTYL ACETATE = 1) NA
VAPOR DENSITY (AIR = 1) NA	
APPEARANCE AND ODOR Colorless, odorless solution	

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD) Not combustible	AUTOIGNITION TEMPERATURE NA	
FLAMMABLE LIMITS IN AIR, % BY VOLUME:	LOWER NA	UPPER NA
EXTINGUISHING MEDIA Any		
SPECIAL FIRE-FIGHTING PROCEDURES Move containers away if possible, cool from side, use flooding quantities of water as a fog. Apply from distance, stay upwind, avoid breathing.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Negligible fire and explosion hazard when exposed to heat or flame.		

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A), will not necessarily be listed on this form even though one or more may be a constituent of this product.

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated, safe use of the materials is the responsibility of the user.

Document Number 205420-001
Rev. D

NA = Not available/Not applicable

**This product contains 10 mg of sodium cyanide per 100 mls
(200mg = LDLO for 70kg individual)

***Non hazardous component

Printed in USA
Form MSDS-6332

120968

PRODUCT NAME: Cyanide Standard 100 \pm 5 ppm CN CATALOG NO.: 940607

V. REACTIVITY DATA

STABILITY: UNSTABLE <input type="checkbox"/> STABLE <input checked="" type="checkbox"/>	CONDITIONS TO AVOID See below
INCOMPATIBILITY (MATERIALS TO AVOID)	Contact with water may cause heat to be released. Contact with acids, flammable liquid, and organic halogen compounds may cause fire.
HAZARDOUS DECOMPOSITION PRODUCTS	May release toxic fumes of Sodium Oxide which can react with water or steam to produce heat or flammable H ₂ gas.
HAZARDOUS POLYMERIZATION: MAY OCCUR	CONDITIONS TO AVOID WILL NOT OCCUR <input checked="" type="checkbox"/> None

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY:	INHALATION? Yes, vapors corrosive	SKIN? Yes-burns	INGESTION? Yes-corrosive
HEALTH HAZARDS (ACUTE AND CHRONIC)	Inhalation-mild to severe irritation, large doses-delayed pulmonary edema, small skin burns with deep ulceration, severe burns and disintegration of conjunctival and corneal epithelium. Corrosion of lips, mouth, tongue and pharynx, vomiting of mucosa-asphyxia can occur from swelling of throat. Chronic-bronchial irritant, coughing, pneumonia, gastro-intestinal disturbances-dermatitis-conjunctivitis		
CARCINOGENICITY:	NTP? Not found	IARC MONOGRAPHS? Not found	OSHA REGULATED? Not found
SIGNS AND SYMPTOMS OF EXPOSURE	Sore throat, coughing, labored breathing. Burns of skin, eyes, mucous membranes.		
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE	Lung conditions, irritated or sensitive		
EMERGENCY AND FIRST AID PROCEDURES	All-get medical attention-Inhalation-fresh air, artificial respiration-if-necessary-keep warm-at rest. Skin-wash with soap and large amounts of water while removing contaminated clothing. Eyes-flush with large amounts of*		

VII. PRECAUTIONS (SAFE HANDLING AND USE)

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Ventilate area, wear impervious gloves, clothing and a face shield. Prevent skin contact- Pick up, oxidize with sodium hypochlorite. Carefully neutralize pH with HCl. Dilute and wash down drain with excess water. Observe all federal, state and local laws.
WASTE DISPOSAL METHOD see above	*water while lifting the lids (15-20minutes). Ingestion-give large amounts of milk and water and allow vomiting to occur. Do not induce vomiting.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Keep cool and well sealed. Store away from acids, flammables. Hazard ratings: Scale (0-3), health 3, fire 0, reactivity 1, persistence 0.
OTHER PRECAUTIONS	Will attack some forms of plastics, rubber and coatings.

VIII. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE)		
100 mg/m ³ SCBA full faceplate		
VENTILATION	LOCAL EXHAUST To meet exposure limits	SPECIAL NA
	MECHANICAL (GENERAL) — NA	OTHER NA
PROTECTIVE GLOVES	impervious gloves	EYE PROTECTION splash proof safety goggles
OTHER PROTECTIVE CLOTHING OR EQUIPMENT impervious clothing		
WORK/HYGIENIC PRACTICES Emergency eye wash should be available—no eating or smoking while using.		